The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879

CLINTON S. DARLING, Editor
CHARLES A. BRESKIN, Adv. Mgr.
E. M. GIBSON, Asst. Mgr.
N. C. ROCKWOOD, Advisory Editor
H. E. HOPKINS, Associate Editor
C. H. FULLER, Mgr. New York Office
GEO. P. MILLER, Manager

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MEMBER A. B. C. MEMBER A. B. P.

W. D. CALLENDER, President
N. C. ROCKWOOD, Vice-President
GEO. P. MILLER, Treasurer
C. O. NELSON, Secretary

Volume 25 June 3, 1922 Number 11

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No Pumping Costs In This Pit

THE J. Fred Smith Gravel Company of Dallas, Texas, first tried to work this pit with steam shovels. They got the gravel out all right, but the continual expense of keeping the pit dry cut heavily into their profits.

Then they installed the Bucyrus dragline shown above, took out their pumps, and now dig their gravel under six feet of water, at a saving of 50 per cent over the costs of shovel operation.

If pumping costs figure too high in your operating expenses it will pay you to investigate Bucyrus Dragline excavators. We build draglines of all sizes from 3/4 to 5 cubic yards. Send for our Bulletin PG and let our representative confer with you.

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CLIP AND MAIL
to nearest office

BUCYRUS COMPANY:

Send me your Bulletin GP and full information on your dragline excavators.

Name.....

Address.....

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R. Prod., June 3

BUCYRUS COMPANY
SOUTH MILWAUKEE, WISCONSIN

411

NON-METALLIC MINERALS

Cement Problems—

1—Quarrying, mining and transportation of raw materials.

2—Proper mixture of raw materials, with a view of maintaining proper and intimate relation of ingredients throughout the burning process.

3—Non-fluctuating, dependable and properly applied heat in kilns with greatest fuel economy.

4—Proper machinery, and proper co-ordination of units for the best milling of the clinker.

5—Storage facilities; bag handling department; economical loading in the carriers.

The portland cement industry is fundamentally a chemical process based on the utilization of non-metallic minerals of varying composition in different localities, and of great physical differences.

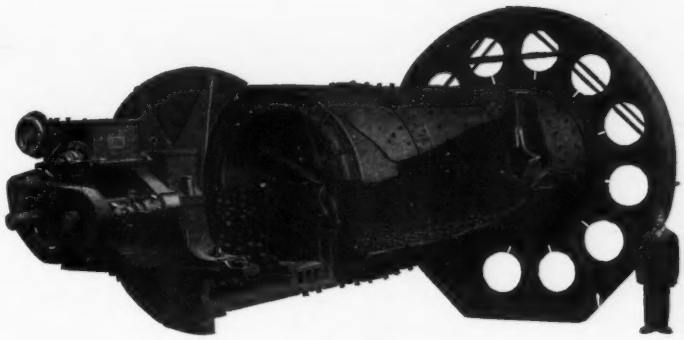
Basically, burning cement clinker is *Ceramics*—heat treating and fluxing of materials; therefore a concern having the greatest experience in *Ceramics*, is vitally essential in the development of a cement plant.

Due to fluctuation in the composition of raw materials as taken from the pit or mine, it is necessary to work on a ceramic and chemical basis; rectifying unforeseen conditions in the mixture.

Variations in stratification of the component minerals, and other constantly changing and often unforeseen elements, calls for a high degree of chemical knowledge.

To completely co-ordinate a plant the whole operation must be visualized from the combined standpoint of the mining, chemical, mechanical, ceramic, and industrial engineer; and it is here the Waller Crow Organization can help you in the successful development of your property, because of their wide practical experience, skill, and technical qualifications.

WALLER CROW, INC.
Engineers
COUNSELLORS IN INDUSTRIAL OPERATION & FINANCE
327 S. LA SALLE STREET • • CHICAGO



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Equipment for Complete Lime Plants

We specialize on equipment for the production of "Agricultural Lime and Limestone." This includes all the equipment entering into the design of the plant, including power requirements.

Let our engineers figure on your requirements
Write for estimates

ALLIS-CHALMERS PRODUCTS
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Steam Engines
Gas and Oil Engines
Hydraulic Turbines
Crushing and Cement Machinery
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ALLIS-CHALMERS PRODUCTS
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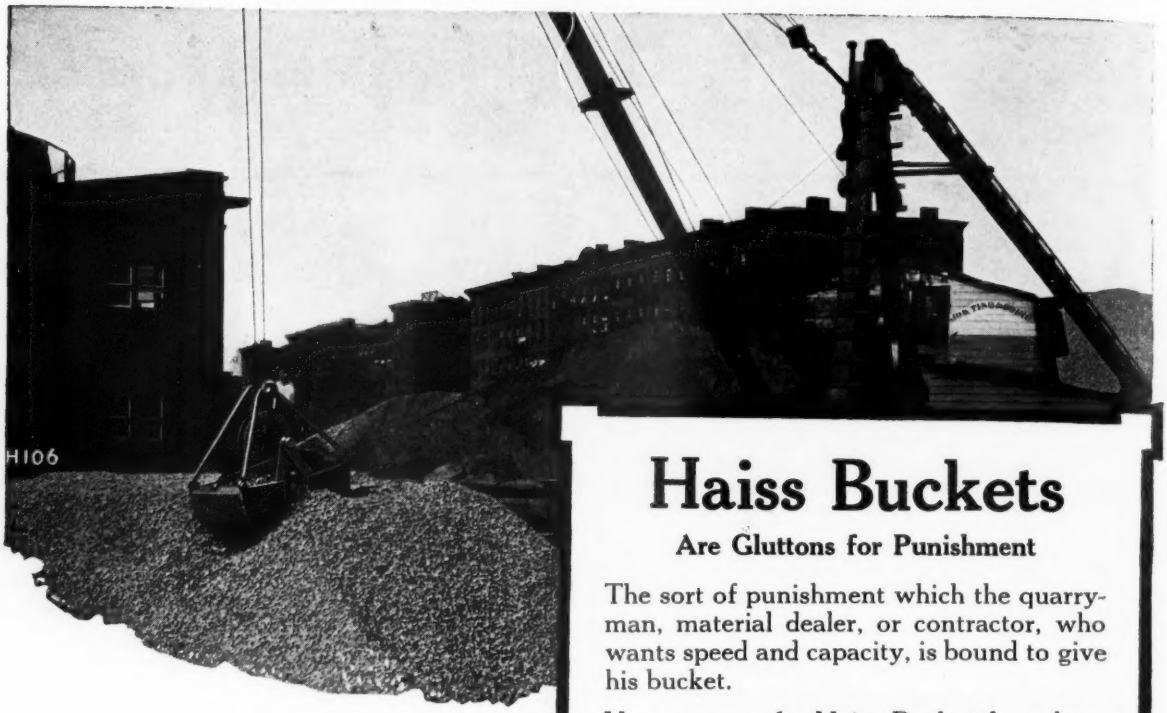


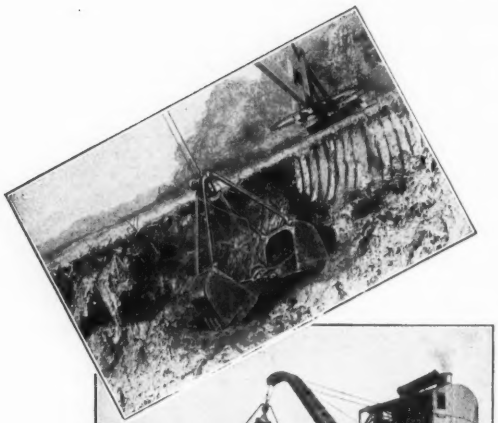
Haiss Buckets

Are Gluttons for Punishment

The sort of punishment which the quarryman, material dealer, or contractor, who wants speed and capacity, is bound to give his bucket.

You can use the Haiss Bucket for rehandling or hard digging—it's built heavy and with a high closing power ratio that makes the hardest digging material crumble and fill the bucket full, every time the jaws close.

And the Haiss Bucket withstands this hard service—the arms are big steel castings, not thin plates; the braces across the back of the bowl are also heavy steel castings; the connecting rods are solid forged steel, round; the flat link side chains are steel, bolted, not riveted; the cutting shoes are broad, and heavy bronze bushings are used in all bearings.



It is the ideal bucket for you because it will do a lot of work and give you no trouble. Bulletin No. 719 describes Haiss Buckets.

The George Haiss Mfg. Co., Inc.

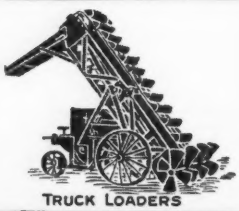
139th St. and Park Ave., New York

Established 1892

Representatives throughout the world

Millar's Timber & Trading Co., London, British Representatives

H-106

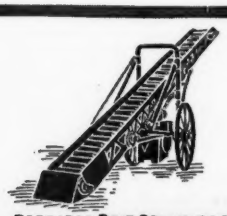


TRUCK LOADERS

HAISS

MATERIALS HANDLING EQUIPMENT

CLAM SHELL BUCKETS



PORTABLE BELT CONVEYORS

Capt. Fowler Says:—

"In Fifteen Years of Sand and Gravel Digging I Haven't Found the Equal of a DREADNAUGHT"

SUPERIOR SAND & GRAVEL COMPANY
Builders and Pavers Supplies
923-931 Dime Bank Building
DETROIT

PRIVATE EXCHANGE CADILLAC 1945

ANDREW H. GREEN, JR., PRESIDENT
DOUGLAS CAMPBELL, SEC'Y-TREAS.
SAMUEL P. CROSS, SALES MANAGER

February
Twenty-seventh,
1 9 2 2

Blaw-Knox Company,
207 Lincoln Building,
Detroit, Michigan.

Dear Sirs:

The Superior Sand & Gravel Company purchased a #623 Blaw-Knox Dreadnaught Bucket in August, 1921. This bucket has been in continuous service during the season of 1921, and I will say that of all the different types of buckets I have used for the past fifteen years, that I do not think that any of them can compete with the Blaw Dreadnaught in hard digging. We have a much harder substance in the St. Clair River than in any place I know of where parties are engaged in the sand and gravel digging.

I can cheerfully recommend this bucket as being one of the best digging buckets on the market today and a bucket that requires the least repairing of any bucket I know of; all wearing parts being made of manganese steel, it is almost impossible to wear them out.

Anyone in the market for a heavy-duty bucket or a bucket for hard digging, will not make a mistake in buying a #623 Blaw-Knox Dreadnaught Bucket, as same can not be beaten.

Yours very truly,

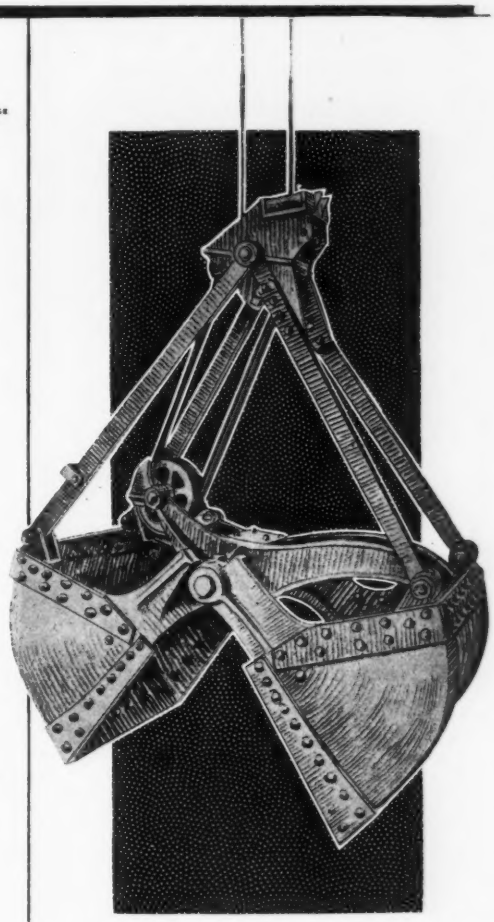
SUPERIOR SAND & GRAVEL COMPANY

Capt. Thos. Fowler

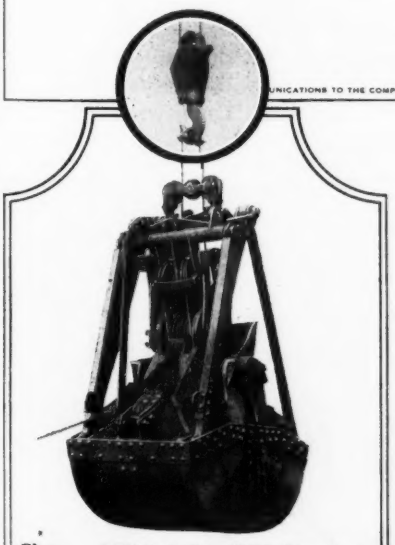
Marine Superintendent

TF/WC

UNICATIONS TO THE COMPANY, AND NOT TO INDIVIDUALS



THE DREADNAUGHT



Blaw Knox **SINGLE LINE Bucket**

Hook it on and go to work!

Read this Letter—the Remarks Therein are Echoed By Every DREADNAUGHT User

Capt. Fowler is right—the DREADNAUGHT cannot be beaten for big loads and freedom from repairs; whether rehandling broken stone for concrete work or in the hardest digging or dredging service.

A DREADNAUGHT more than satisfies—it's a real asset to the man who does a lot of digging and handling.

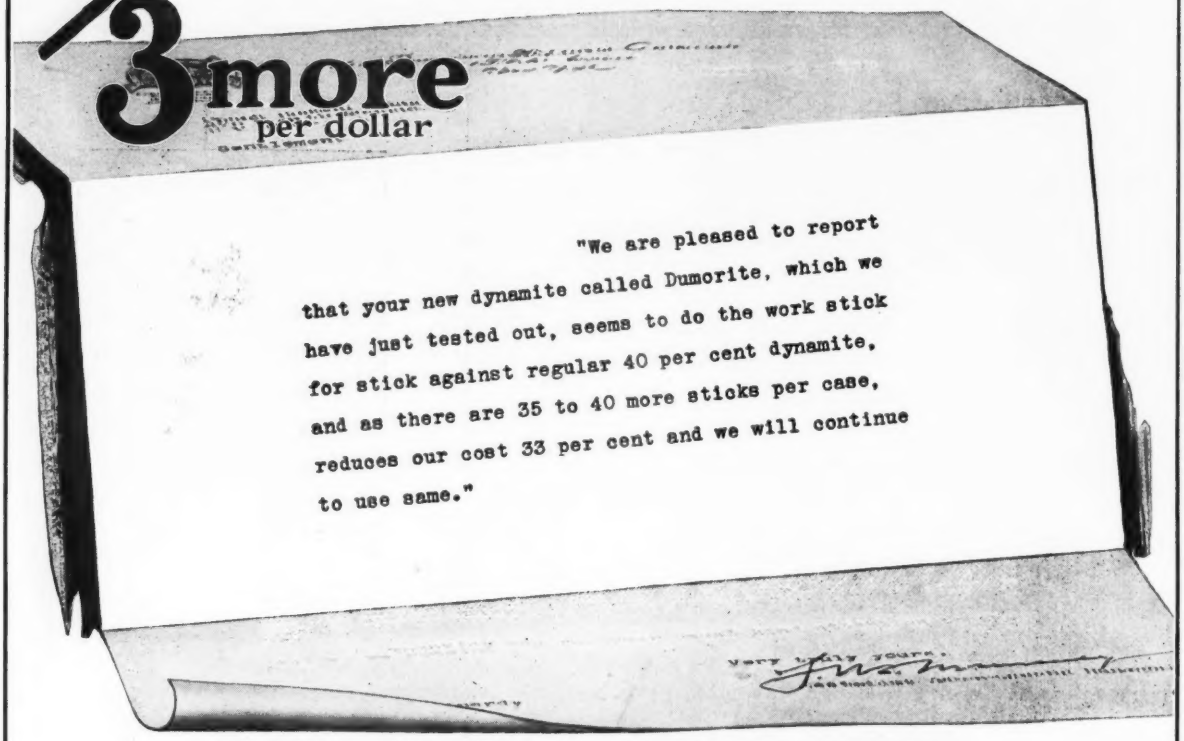
BLAW-KNOX COMPANY
619 Farmer's Bank Bldg., Pittsburgh, Pa.

New York Detroit San Francisco London, Eng.
Chicago Baltimore Birmingham

Blaw Buckets

1/3 more per dollar

Below is excerpt from a letter written by a user of Dumorite in quarry operations.


"We are pleased to report
that your new dynamite called Dumorite, which we
have just tested out, seems to do the work stick
for stick against regular 40 per cent dynamite,
and as there are 35 to 40 more sticks per case,
reduces our cost 33 per cent and we will continue
to use same."

O. K'd. BY THE SEVEREST JUDGES

NO one is better fitted to judge the value of an explosive than the men in the quarries who shoot it.

We have stated that Dumorite does approximately the work of 40% dynamite stick for stick. Above is an excerpt from one of many letters from quarrymen testifying to this fact.

Remember that Dumorite gives you 35 to 40 sticks per case more than "40%" at the same price. Get in touch with our nearest branch and let Dumorite save money for you, too.

E. I. DU PONT DE NEMOURS & CO., Inc.

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Birmingham . Ala. Duluth . . Minn.
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Explosives Department
Wilmington, Delaware

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NON-HEADACHE DU PONT NON-FREEZING

DUMORITE

THE LATEST OF A COMPLETE LINE OF DU PONT EXPLOSIVES

The First American Quarrymen

When the mammoth and the mastodon grazed in the vast places of our early country, prehistoric men were excavating rock on the southern shores of Lake Superior.

The men of the Stone Age first built fires to disintegrate the harder rock. Then they broke it by pounding with stones, clutched in their hands, or occasionally grooved and fitted with a handle. Hammers of diorite or porphyry, shaped by the waters of the lake or by hand; wedges made of native copper which was found in the outcrops; shovels of cedar that were used only as scrapers; bailers of bark or carved wood—these were the tools used in their excavations.

Methods of quarrying improved slowly through the ages; but not until the introduction of explosives was the economical production of large tonnages possible. Perhaps no other single invention has helped as much to reduce the cost of quarrying as has dynamite.

High cartridge-count dynamites have been one of the greatest recent aids in reducing blasting costs. We have, for several years, recommended Hercules Special No. 1 because of its high cartridge-count and low cost per cartridge. It does approximately as much work per cartridge as 40% dynamite, yet costs less per cartridge than 15% dynamite. It is made of the highest grade of standard materials and by wide use in the field has proved its dependability. No high explosive on the market is more economical than Hercules Special No. 1.

Write to our Advertising Department, 951 King Street, Wilmington, Delaware, for our booklet "Volume vs. Weight, A Lesson on Explosives Economy."

HERCULES

POWDER COMPANY

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St. Louis, Mo.
Salt Lake City, Utah
San Francisco, Cal.
Wilkesbarre, Pa.
Wilmington, Del.

SHOPE BULLETIN

VOL. I June 3, 1922 Number 20

A Modern Industry

The clay brick industry has changed but little since the first batch of mud was mixed, molded and burned. The concrete brick industry is a development of the manufacture of Portland cement. It is natural that there should have been many attempts to make concrete brick, but the thought has been mainly expended in producing a machine to make brick. The contrary has been the case with the Shope brick process, for knowing that quality concrete brick could be made, D. F. Shope first developed a process of manufacturing beautiful face brick. The machines were incidental to the process. Shope concrete brick are a natural product resulting from the law of crystallization.

Shope brick plants are only established in assigned territories on a license agreement which protects the Shope brick licensee in the assigned territory. Shope service includes the furnishing of Shope brick machines, Shope tile machines, Shope stone machines, Shope truck conveyors, pallets, mixers, boiler and all accessory apparatus required for a complete plant no matter how large or how small the capacity desired. Full co-operation is given in layout of plant and buildings, in operating the plant, and in marketing the brick at a profit. All of this service is based on 15 years' experience in concrete brick making and experience in making and selling clay brick.

In considering the concrete brick industry one must realize the difference in attempts at success and success as an accomplished fact. Careful investigation will prove that all of the claims made herein are true and that the manufacture of Shope concrete brick can be conducted as a profitable business.

Shope brick plants are in successful operation in various parts of the country

Shope Brick Company

361 East Morrison Street Portland, Oregon

LICENSEES:

The Miles Co.—Salem, Ore.	Dark Canyon Stone Co., H. W. Jones, Mgr., Rapid City, S. D.
Eugene Concrete Co.—Eugene, Ore.	Warren Sand & Gravel Co.—Easton, Pa.
Wastenburg Brick Co.—Klamath Falls, Ore	Penn Shope Brick Co.—Reading, Pa.
Arizona Shope Concrete Brick Co.—Phoenix, Ariz.	Lycoming Shope Brick Co.—Williamsport, Pa.
Florida Nu-Tex Brick Co.—109 Water St., Tampa, Fla.	Shope Brick Co.—Portland, Ore.
Texas Shope Brick Co.—3056 Sumpter Bldg., Dallas, Tex.	Rustic Brick & Supply Co., Palette Rd., Ford City, Ont., Can.
Birmingham Slag Co.—Birmingham, Ala.	Puyallup Shope Brick Co.—Puyallup, Wash.
Shope Brick Co. of Wisconsin—50th and State Sts., Milwaukee, Wis.	The Shope Brick Co.—Springfield, Mass.
The Polychrome Cement Brick & Tile Co.—Carter-Cotton Bldg., Vancouver, B. C.	Utah Shope Brick Co., P. O. Box 632, Salt Lake City, Utah
	Decoration Brick Co.—1565 N. Lake Ave., Seattle, Wash.

These licensees are all successful manufacturers

The BESSER

ONE TON OF PIG IRON COSTS $21.00

ONE TON OF WATCH SPRINGS COSTS $250,000.00

THINK

How manufacturing increases the value of the raw material and enlarges the profits of the manufacturer

It's almost the same with ***your*** reject piles of sand, gravel, etc. Turn them into a finished product like Concrete Block, Brick or Tile, and you greatly increase their value and receive ***two*** profits—big ones, too, ***when*** you make your concrete units with

Besser Automatic Machinery

BESSER Concrete Products Machinery turns your piles of reject into money. A BESSER Automatic Combination Block and Tile Machine takes all the guess work out of the concrete products business. Remember—the BESSER makes ***both*** block and tile on the ***same*** machine, no double outlay for machinery or overhead. And the BESSER produces the highest grade units in the greatest number—at the least cost. The result —Big Profits and a practical monopoly.

There's big money in the Concrete Products Business—Start NOW and Start Right—with a BESSER.

Let our engineers figure with you on your problems. Write *today*

BESSER SALES COMPANY

Complete Equipment for Concrete Products Plants

349 Monadnock Building **Chicago**

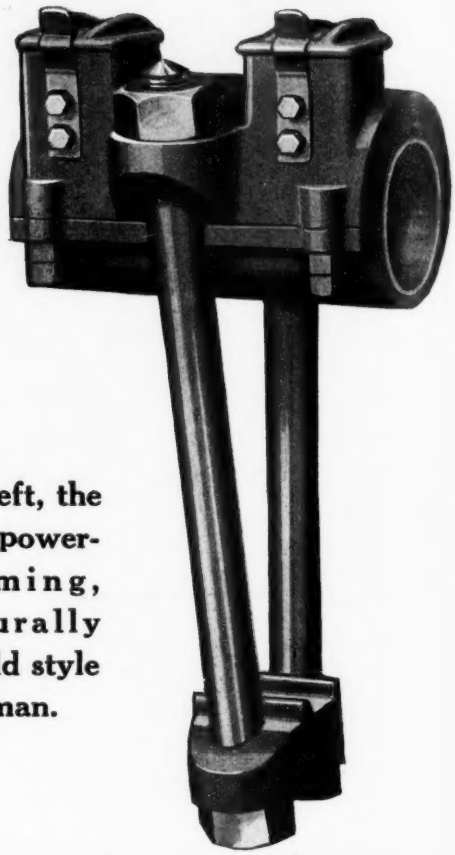
Better Own a

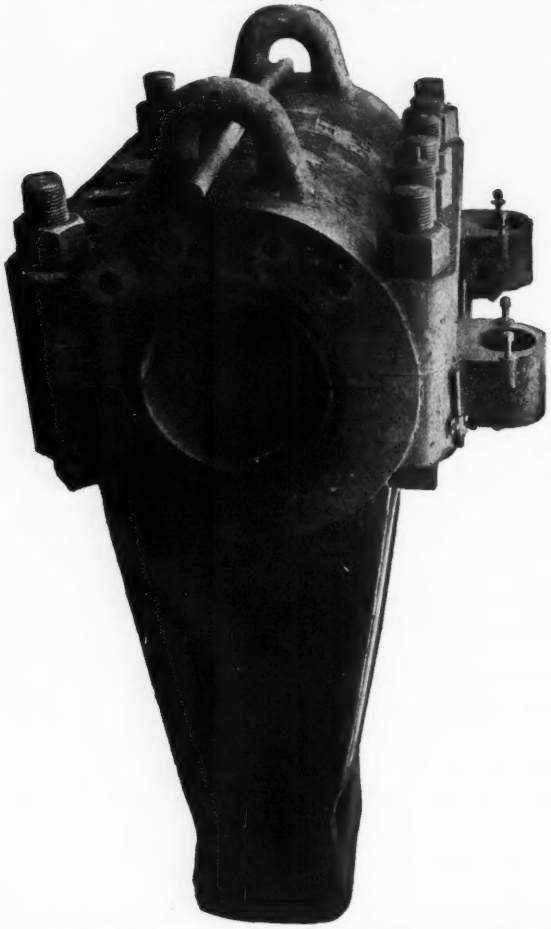
Than Compete With One

ENDURINGLY EFFICIENT

TRAYLOR
BULLDOG PITMAN

Can anyone hesitate in making a choice with regard to this most important part of a crusher?





To the left, the heavy, power-consuming, structurally weak, old style cast pitman.

To the right, the new, sensible Bulldog Pitman—simple, of known strength, repaired quickly when necessary—power-saving, accessible and dependable.

Only one part of many exclusive features of THE BULLDOG JAW CRUSHER—IT'S PATENTED

BULLETIN 99R DESCRIBES AND FULLY ILLUSTRATES

TRAYLOR ENGINEERING AND MANUFACTURING COMPANY
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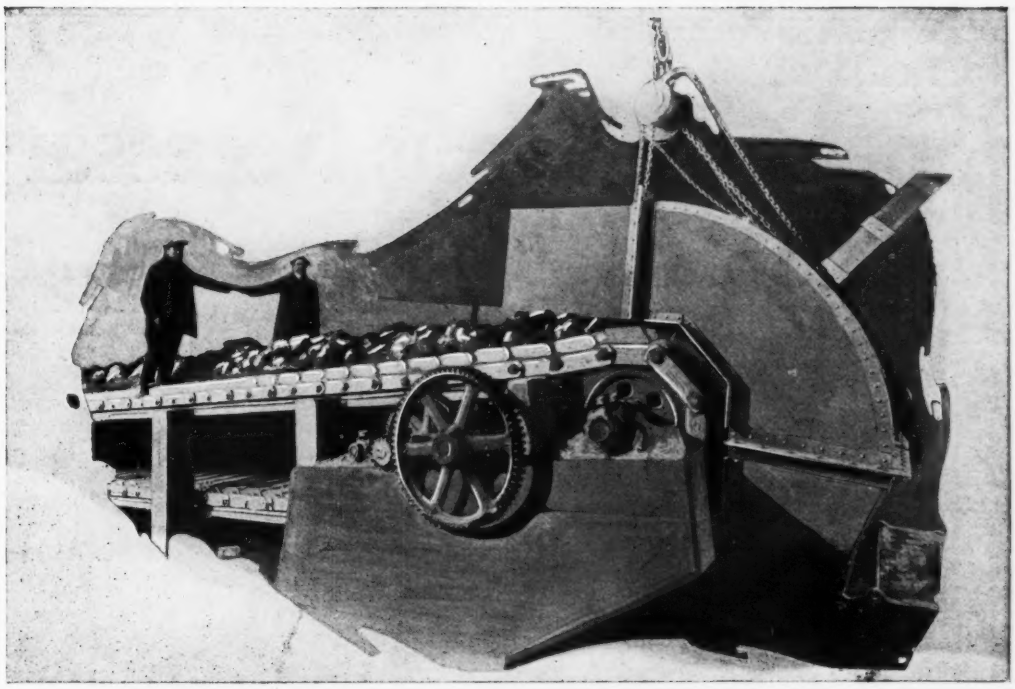

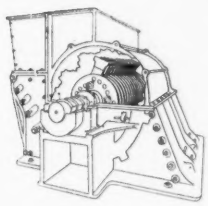

"We take pleasure in advising you that the No. 6 Jumbo, which we installed in our plant five years ago, has taken care of all the rock for the manufacturing of cement at our plant, producing from 400,000 to 600,000 barrels annually, besides furnishing commercial rock for our home trade, with the same set of hammers and without any cost for repairs except for rebabbitting the main bearings.

"It has been a source of pleasure to operate this crusher from every standpoint in the producing of our product."—The Monarch Cement Company, Humboldt, Kans.

"I have been operating your No. 2 Combined Crusher and Pulverizer for the past 60 days with 5 men, and am handling from 12 to 15 tons an hour feeding in limestone weighing 60 lbs. to 100 lbs. and pulverizing it to fertilizer size in one operation.

"At the rate I am operating, this machine will pay for itself in four months' time."—Otto Orth, Webster Groves, Mo.

5 Years of Rock Crushing for Cement—no Repairs

It doesn't make any difference what the Williams Mammoth or Jumbo Rock Crushers are used for, the economy results are the same.

The initial investment, in relation to capacity, is far lower. The operating costs are far lower. The depreciation costs are far less. The repair expense is very, very much less.

For example, read the letter to the left, from the Monarch Cement Company, which shows that they have crushed rock for over 3,000,000 barrels of cement with the same set of hammers, and practically not a cent's cost for repairs.

Whatever rock crushing field the Williams goes into, it shows the same cost lowering record. In reducing the product of largest jaw crusher to 1½ inch and finer, the Riverside Portland Cement Company averaged 200,000 tons of rock crushed to one set of hammers.

Are you interested in reducing costs in any field of rock crushing? The evidence that we can put into your hands will be absorbingly interesting to you. Why not write for it today, telling us what kind of rock crushing you are interested in?

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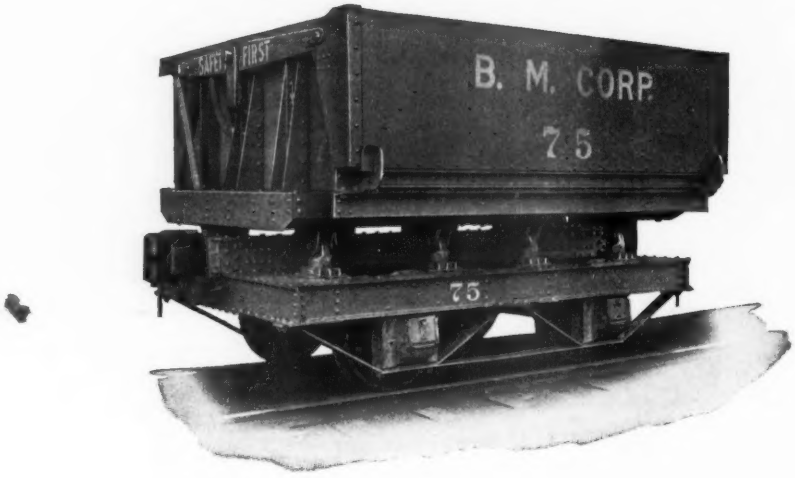
Specialization is Necessary to Design Quarry Cars



Enormous strength combined with flexibility are necessary elements of Quarry Car Construction. The rigid car can not be built that, without flexibility, will withstand all classes of quarry service and safely carry all classes of quarry loads.

The body of the one-way dump car shown above rides on heavy spring supports. It is a real pleasure to the experienced quarryman to see this car travel uneven track under load and to watch the shock absorption of the compensating spring supports. The car is supported at eight points. Bed floor is covered with heavy steel floor plates, reinforced with T-Rails fitted between floor planking. Wheels and axles are standard M.C.B. with journal boxes in spring pedestals. Cast steel pedestal columns—Capacity 10 cu. yds. The same car has been built in capacities of 5, 6, 8 and 12 cu. yds.—also in all steel construction.

We specialize in designing and building cars to meet special and arduous conditions.

Let us show you other designs as suggestions.

Write for Catalog No. 515

The Kilbourne & Jacobs Mfg. Co., Columbus, O., U.S.A.

New York—120 Broadway

Announcing
REDUCTION IN PRICES
on
Oxweld and Eveready Apparatus for Welding and Cutting Metals

EFFECTIVE JUNE FIRST, prices on Oxweld and Eveready Apparatus were substantially reduced.

Every manufacturer or shop owner, user or prospective user of the oxy-acetylene process for welding and cutting metals will find it to his advantage to inquire for information concerning this price reduction.

We especially stress the fact that this reduction has been accomplished without change in the superior design of Oxweld and Eveready Apparatus or the completeness of Oxweld Service.

Full information and any other service may be secured from our resident Sales and Service Engineers in the following cities:

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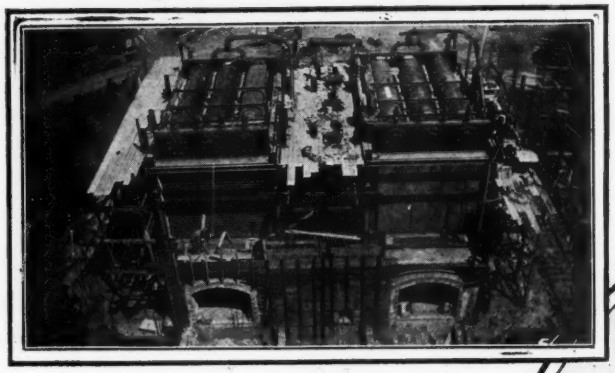
Getting a Three-Fold Advantage from the Edge Moor Waste Heat System—

Increased Kiln Capacity, Efficiency, and Fuel Economy



Edge Moor Waste Heat Boilers at Western States Portland Cement Co., Independence, Kansas. 2176 H. P.

Waste Heat Plant during erection, Western States Portland Cement Co.

BY means of the Edge Moor Waste Heat System, the kiln operator can obtain a uniform draft in all kilns, and has complete control at all times of the quantity and quality of the output. Under these conditions, continuous operation at maximum efficiency is assured.

Production of clinker has in some instances been increased 25% after installation of the Edge Moor Waste Heat System.

In one large plant, this system resulted in the saving of 1200 tons of coal **weekly**, and completely paid for itself in one year.

Full information about the guaranteed economies that can be effected by the Edge Moor Waste Heat System will be sent at your request.

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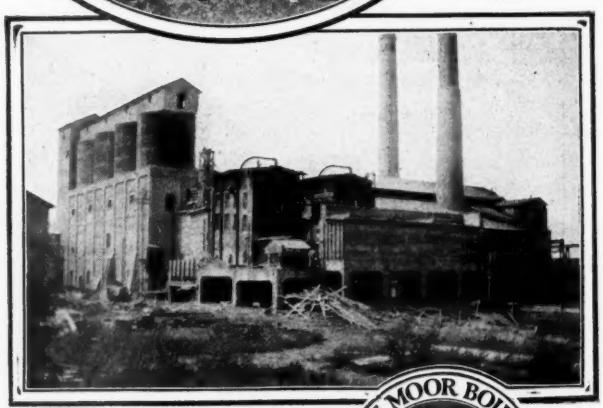
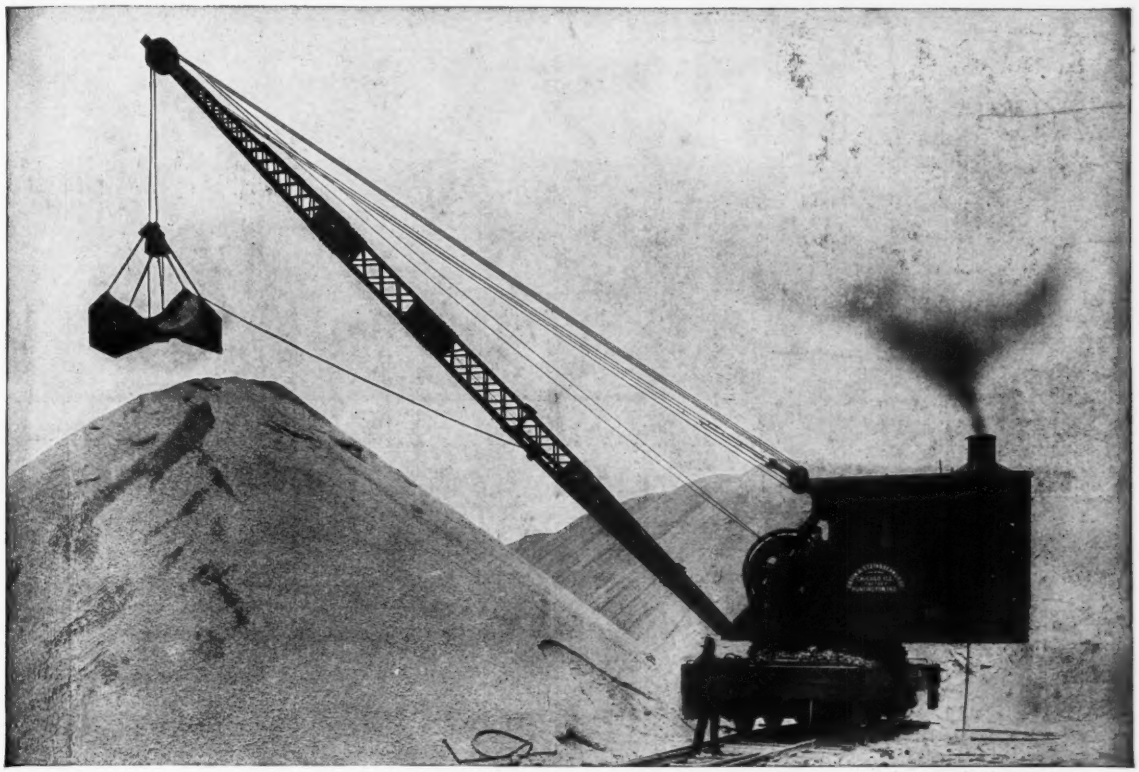


General view of Western States Portland Cement Co.'s plant during erection, with waste heat boilers in foreground.

EDGE MOOR Water Tube BOILERS

FOR INCREASED FUEL ECONOMY



30-TON CRANE
With 60-ft. boom and 2-yd. bucket

O. S. DEPENDABLE

LOOK at the problem squarely—Some day you will use O-S-Dependable Cranes and Grab Buckets and forever after you will be a defender of their merits.

The material handling machinery made by Orton and Steinbrenner Co. is not "just suitable." It is unsurpassed for simplicity and accessibility. The quality of the material and workmanship insures a rare economy of performance.

Our booklet on this subject is profusely illustrated with photos of our cranes on the job and contains a world of information concerning details that are far beyond the space limitations of this advertisement.

It will be sent to you on request

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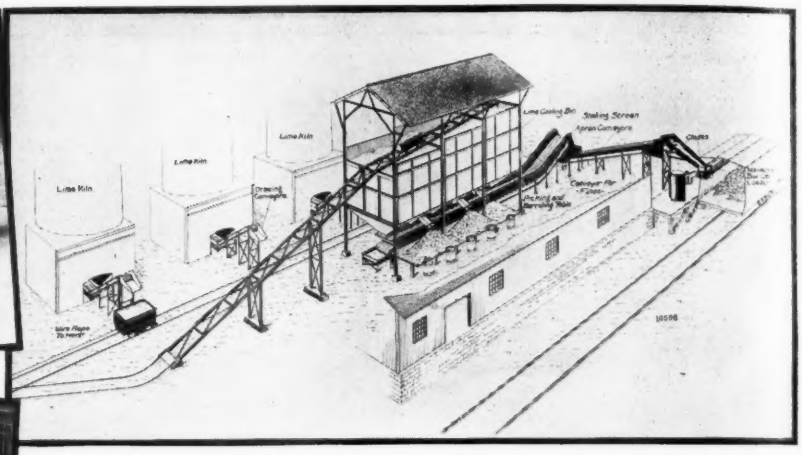

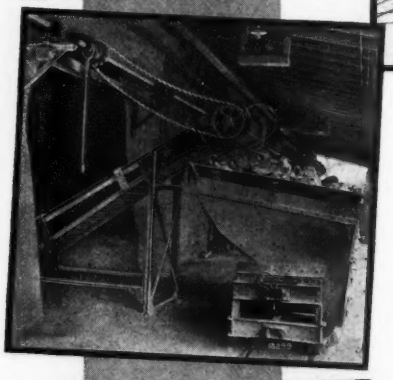

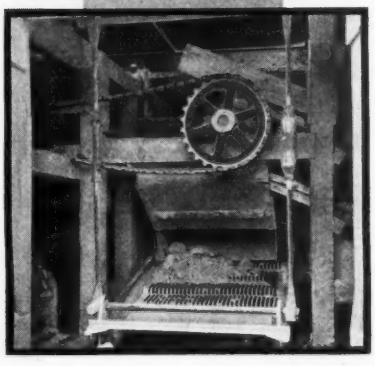

LIME PLANT OPERATORS!—

WHEN you have finally gotten that troublesome stripping done—

WHEN the quarry is cleaned up and the stone is coming along in good shape—

WHEN the kilns are in good order and begging for more stone, and the fuel ratio mounting up to somewhere near where it should be—

WHEN the men understand that a good day's work is what you are paying them for—

WHEN the hydrator has decided to turn out a product that you can be proud of, and the railroads are offering you cars to an embarrassing extent—

WHEN all these things have come to pass and you begin to congratulate yourself as the operator of an economical plant—

THEN sit down and figure out how much your hand labor costs in getting lime from the kilns through its various handlings to the box car—and write to us.

LINK-BELT COMPANY

World's largest manufacturers of elevating, conveying and power transmitting machinery

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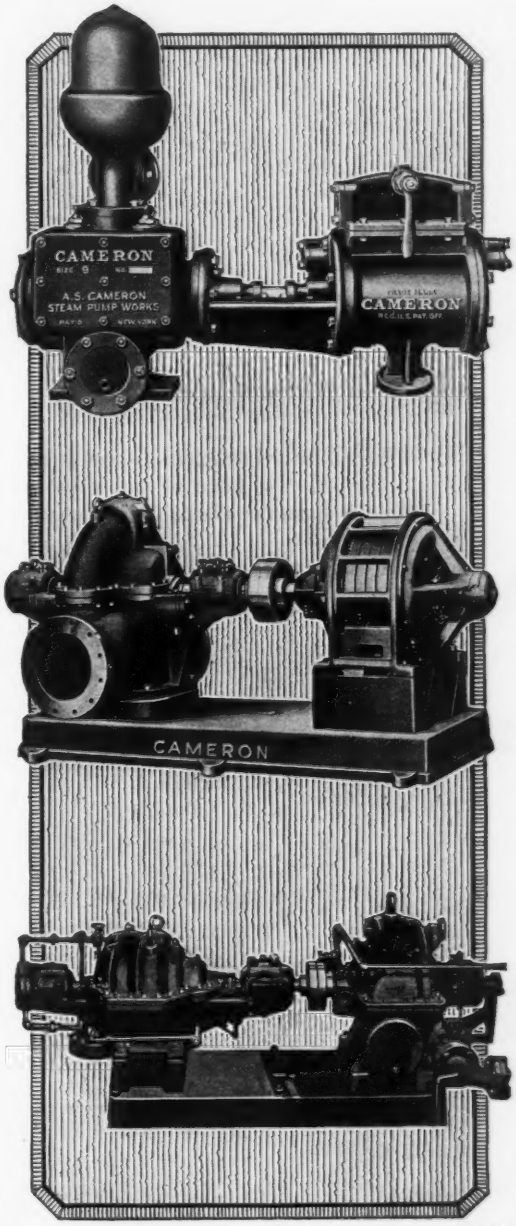
The Right Pump for Each Installation—Specify Cameron

Many pumping projects are being inefficiently handled because the wrong *type* of pump has been installed. Because a pump is of standard make should not be a lone factor in determining whether or not it is of the type best suited for the work.

It is of primary importance that the pump shall fulfill the specific requirements of the job.

For sixty years it has been the policy of the A. S. Cameron Steam Pump Works to recommend the right type and size of pump best fitted to meet the exact working conditions. This guarantees satisfactory and efficient service by every Cameron Pump.

Cameron Engineers are at your service in helping to make your pump selection. Write for details on your particular requirements.



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PLYMOUTH Locomotive in Plant of Charles Warner Company, Wilmington, Delaware

The Plymouth Locomotive shown above, handles twelve cars, each loaded with two tons of one-man quarry stone, — 24 tons without weight of cars. It handles these trains readily against 4 per cent grades.

In the quarry, in the sand, gravel or clay pits,—anywhere, if track can be laid,—the Plymouth is the economic method of haulage.

If Assembled In Convention

If all the manufactured gasoline locomotives were gathered in convention, the PLYMOUTHS would occupy two-thirds of the seating capacity.

It is their utility that enables them to thus predominate. Pep is the only word that has the punch to describe the "pick up and snap," the "hurry and get there."

From the sputtering stream of molten metal to the finished PLYMOUTH on the rails, there is pep,—abundant pep.

The Fate-Root-Heath Co., Plymouth, Ohio

PLYMOUTH

Gasoline Locomotives

Rock Products

Volume XXV | Chicago, June 3, 1922 | Number 11

Conveying Lime by Air

The Riverton Lime Co. plant at Riverton, W. Va., possesses an unusual installation for moving its lime from the kilns to the hydrator. The airveyor, developed largely in handling grain, is now quite extensively adopted to handle soda ash, salt, phosphate, fertilizer and the like

MANY features of William E. Carson's Riverton Lime Co. plant are unusual. Some of these features have already been described in ROCK PRODUCTS. One thing that hasn't been mentioned, because we wanted to see how it was going to work out, is his system of transporting lime from the kilns to the hydrating and packing plant, 200 ft. distant and on the opposite side of the Norfolk & Western Railway tracks.

General view of the plant of the Riverton Lime Co.; kilns and lime-loading plant in right-hand foreground, hydrating plant in the left background

The "Airconveyor"

This is an "airveyor"—a patented device manufactured and installed by the Guarantee Construction Co., New York City. Mr. Carson's plant is the first installation of one of these devices in the lime industry. He says (March 14, 1922), "it is working regularly and giving us great satisfaction."

The airveyor is a pneumatic conveyor especially designed to handle granular material. It was developed largely in handling grain, but has more recently been quite extensively adopted in the chemical industries for handling soda ash, salt, phosphate, fertilizer constituents, etc.

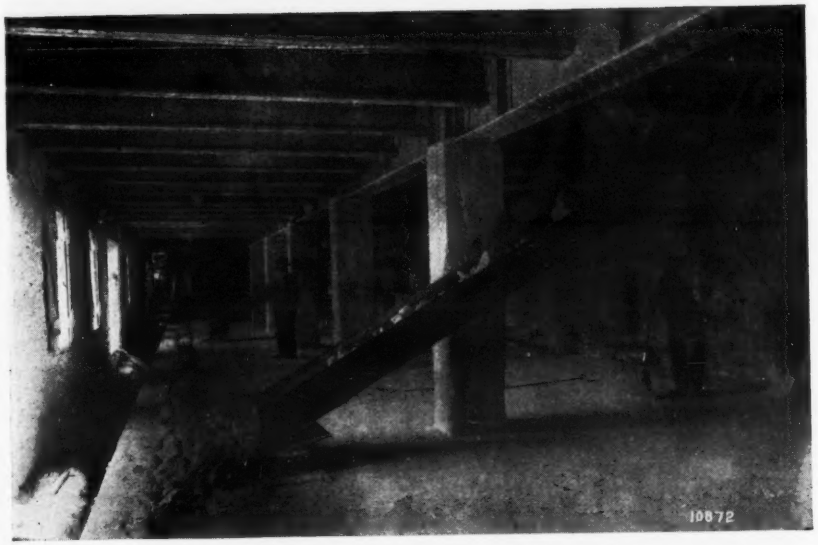
Principle of the Pneumatic Conveyor

The principle of the pneumatic conveyor is simple. A partial vacuum is maintained within an enclosed tank by a motor-driven exhauster. The conveyor ducts lead to this tank and are provided with intakes or self-feeding nozzles. The high velocity of air blast within the duct conveys the material, which is released upon dissipation of the blast within the tank. The material passes through a rotary air lock discharge gate directly to the storage bins, or may again be blown to remote discharge points by utilizing the air blast from the discharge side of the exhauster. A suitable dust collector is provided to protect the exhauster, and with hot materials automatic cooling or quenching occurs in transit.

Rotary Positive Exhauster Is Used

In this system the rotary positive ex-

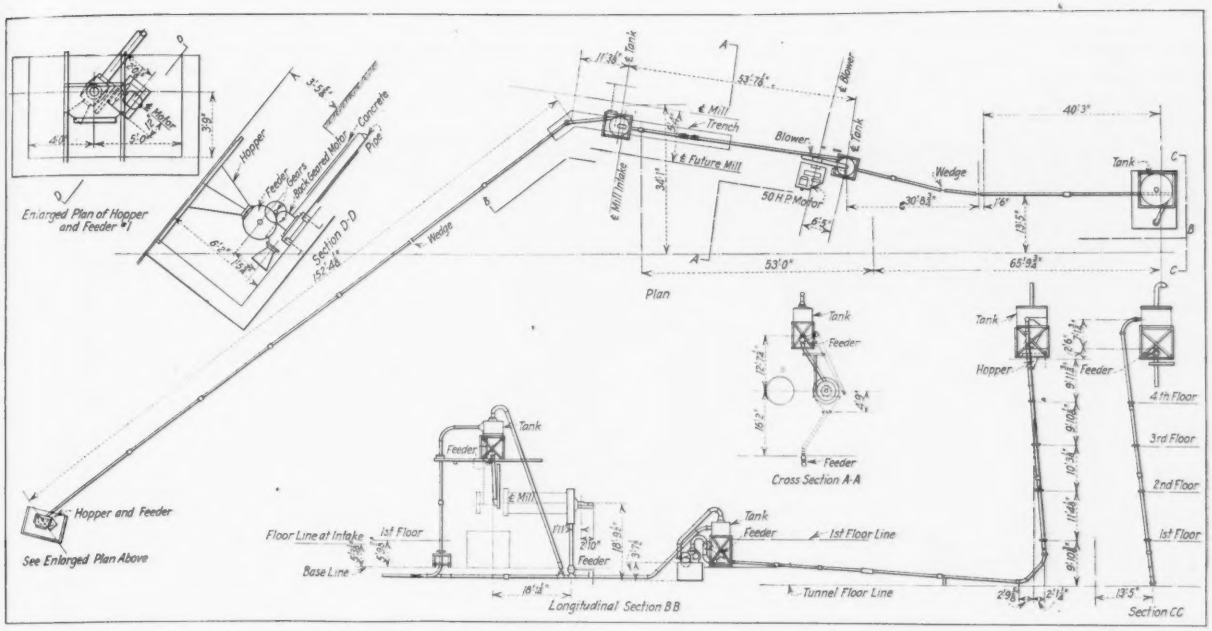
Kilns and elevators; lime-handling plant at the right



Discharging lime from cooling bins to pan conveyor

Airveyor showing exhaust end toward the hydrator

Barrel-loading bin behind the car loader



Diagrammatic layout of airveyor system for transporting lime at Riverton plant

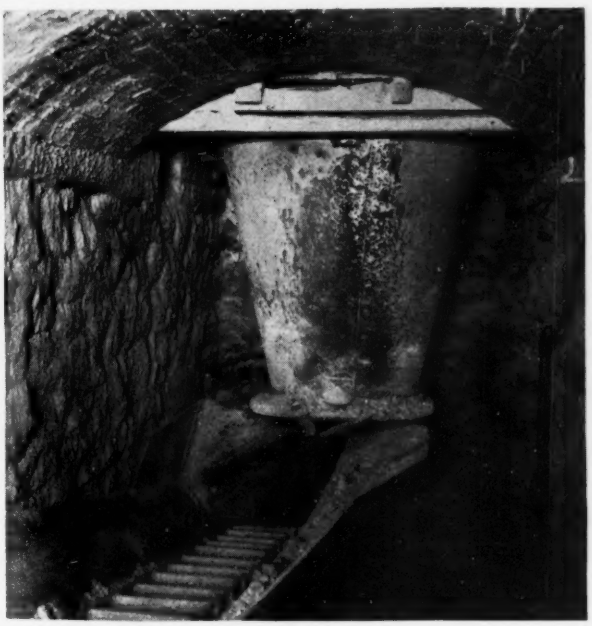
hauster is used on account of its efficiency, ruggedness, simplicity, and low maintenance cost. These exhausters are of the constant-volume, variable-pressure type, automatically adjusting the suction to the varying demands of the conveyor line.

The Riverton installation has a 75-hp. exhauster driven by a 100-hp. motor. It has a capacity from 14 to 20 tons per hour, and according to Mr. Carson, the estimated cost of operation is 14 cents per ton.

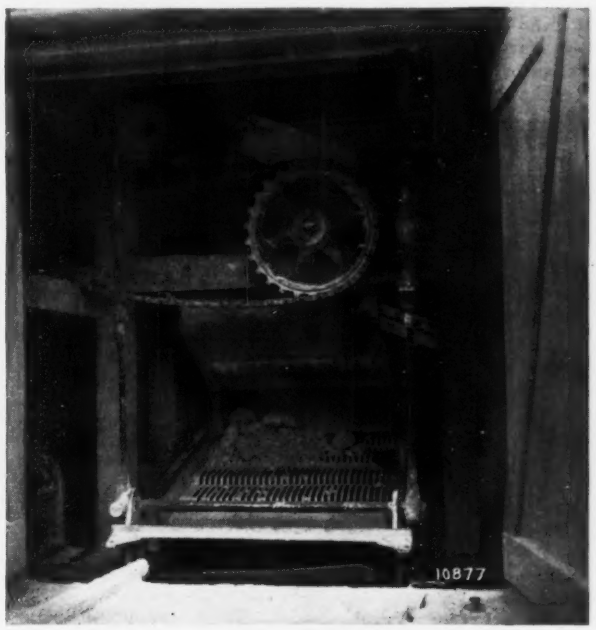
Scheme of Operation

The Riverton plant has three producer-gas kilns and five coal-fired kilns. The kilns are drawn upon pan conveyors and elevators deposit the lime in cooling bins. From these the lime is drawn out through hoppers in the bottoms upon a pan conveyor extending the length of the kiln room below the bins. This pan conveyor feeds shaking screens which pass the fines to a crusher below and the lump lime to a box car loader, to a barrel-feeding bin. The screens, of course, may be bypassed and all the lime crushed if desired.

The lime leaving the crusher is fed to the intake of the airveyor, which deposits it in the bin feeding the hydrator in the building 200 ft. away. On the way to the hydrating plant the lime may be bypassed through a tube mill for further grinding before being put through the hydrators. This produces an exceptional quality of hydrate.



Kiln-discharging conveyor

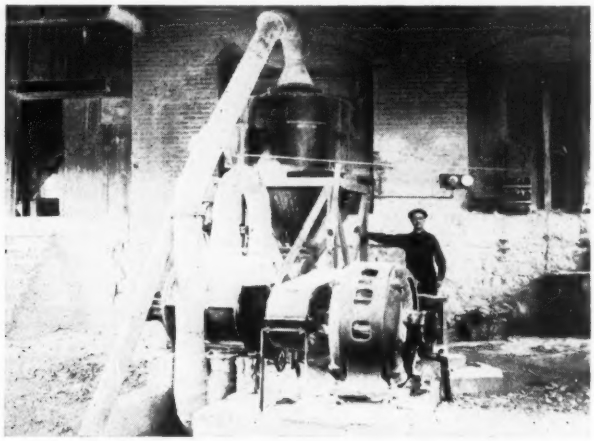


Conveyors discharging to shaking screens

Barrel-loading bin behind the car loader

Airveyor showing exhaust end toward the hydrator

The hydrators used are Mr. Carson's own invention and are of the vat type, in which the lime is allowed to remain for some time in order to "season."



Airveyor in action in the Riverton lime plant

(The general views of the Riverton plant, excepting those showing the airveyor, are reproduced by courtesy of the Link-Belt Co., which made the lime conveyor and loading installation.)

Leaves and Lime Make Good Fertilizer

THERE is considerable plant food to be found in ordinary forest leaves. They also contain an acid which should be neutralized before they are fit for fertilizer. Air-slaked lime is good to use with the leaves. Our plan would be to fill this pit about 9 in. or a foot deep with leaves, thoroughly packed down. If the leaves are dry, pour on enough water to make them damp, and pack them down hard.

Then scatter on enough lime thoroughly to whiten the surface. Seven or 8 lb. ought to be enough for one application. Then put on more leaves and pack down in the same way, with more lime to follow. If possible to obtain it, throw in with each layer a small quantity of chicken manure or fine stable manure, and if it can be done conveniently, pour in the waste from the house. Keep the pit well stamped down and build up the compost layer by layer, as here described.

If it is possible to do so, work the compost over once or twice during the winter, using a manure fork so as to thoroughly mix the compost. If this is well done you will have in the spring a compost nearly or quite equal to ordinary manure. It seems easy to do this, but you will find that raking up and gathering the leaves is a good deal of a job. They are so light and bulky that it is rather difficult to handle them rapidly. If they are to be raked up for burning, as is usually the case, you will find it far more economical to handle them in your pit rather than to make a bonfire of them.—*National Lime Association Bulletin.*

Fippin to Organize Agricultural Consultant Bureau

ELMER O. FIPPIN, who recently resigned as secretary and general manager of the National Lime Association, will organize the National Agricultural Consultants' Bureau, with headquarters in Washington. He will continue to be affiliated with the Lime Association, giving a considerable part of his time to that organization in its agricultural department in a consulting capacity.

Elmer O. Fippin now the head of Agricultural Consultant Bureau

Based on the wide, intimate acquaintance of Mr. Fippin with soils and the methods for their improvement, crop adaptations and cultural practices, and with the business and economic aspects of agriculture throughout the United States—especially in the Eastern half growing out of his work with the Department of Agriculture, with the Agricultural College of Cornell University, and in other lines—he will extend the facilities of the new organization to those interested in farm lands and farm development, special crop production, soil improvement materials, park soil management, agricultural investment and finance.

"Agriculture is a broad field involving so many technical as well as business aspects," says Mr. Fippin, "that it can only be developed to the highest state of efficiency by the aid of specialists in the several fields upon whom the farm operator and others interested in his problems may draw."

The new organization projected by Mr Fippin will cultivate those aspects beyond the range of service that can properly be rendered by public agricultural institutions, especially that field involving consideration of the business aspects.

Better Co-operation Between Contractors and Engineers

IN a paper read before the Cleveland Engineering Society recently C. H. McAllister, general manager of the Lake Erie Construction Co., Cleveland, said:

"We believe that specifications covering the proportioning of the aggregates used in mixing concrete should be simplified and strengthened. The responsible contractor bases his estimate on the use of satisfactory material; the irresponsible contractor generally figures on the cheapest material it is possible to buy, regardless of its quality.

"Because of the conditions existing at different places, so far as variety of materials is concerned, specifications should definitely cover the quality desired by the owner, and there should be no opportunity for the irresponsible contractor to become misled through the specifications. It should be the duty of every reputable engineer to thoroughly investigate the quality of the materials available for his work so that he may specify what is to be used. The specifications covering the proportioning of the aggregates should be carefully drawn.

"Many times expensive cement is wasted because of the indifference of those interested in the proper proportioning of the aggregates. If this was given careful attention the reputable supply dealers in the various communities would of necessity have accurate information for the contractor as to the weight of the aggregates per cubic yard, the percentage of voids contained in such commodities as gravel, crushed stone and slag, and would also furnish through their sales department a report on the character and quality of the material."

Pure Calcium Carbonate or "Iceland Spar"

Limestone in its most valuable form is to be found in Iceland spar, occurrences of which are had in California, Montana, and in Spain and Argentina. Mr. Bowles' article relates its properties and uses

By Oliver Bowles
Mineral Technologist, United States Bureau of Mines

ICELAND SPAR is a name given to a pure crystallized form of calcite ($CaCO_3$), which is sufficiently transparent and free of defects to be used in the manufacture of optical instruments. While the actual requirements are small, the degree of purity and physical perfection demanded renders it somewhat difficult to obtain suitable material.

The properties of value in Iceland spar are its transparency combined with double refraction. It is used in the manufacture of polarizing microscopes, saccharimeters, colorimeters and photometers. Its most important use is in the manufacture of Nicol prisms, which constitute an essential part of every polarizing microscope. The principle governing the construction of the Nicol prism is as follows:

Ordinary light in passing through a crystal of calcite is resolved into two rays of plane polarized light vibrating in planes at right angles to each other, and having different indices of refraction. Thus the two rays follow different paths through the crystal. The prism of Iceland spar is cut diagonally and cemented together again with a transparent cement having an index of refraction intermediate between the two rays passing through the prism. Canada balsam is employed for this purpose. The prism is cut at such an angle that the ray having the greatest index of refraction meets the surface of the balsam at an angle greater than the angle of total reflection, and it is thus deflected to the side of the prism, while the second ray passes through. Thus one of the rays is eliminated and polarized light vibrating in a single plane is obtained.

The behavior of polarized light in traversing various minerals is found to be a ready means of identifying them, and of studying their properties, and thus Iceland spar renders a service of inestimable value in the study of every known mineral with the possible exception of the opaque minerals, and it may be added that it is also useful in the study of certain industrial products.

Physical properties of Iceland spar that have a direct bearing on the mining methods employed are its perfect rhombohedral cleavage, a cleavage in three directions at oblique angles to each other, and its susceptibility to abrasion or scratching. The crystals cleave so readily that light blows will shatter them into fragments, and as they are soft enough to be readily scratched with a knife, extreme care must be taken in handling them.

The best grade of optical spar sells at from $10 to $20 per pound. Specimen material commands a price of $1.50 to $2 per pound, and standardization spar about $1 to $2 per pound.

Prior to the war finished prisms and other forms used in optical instruments were prepared in Europe, but during the latter part of the war when the supply in stock was exhausted American companies were obliged to undertake such manufacture. Iceland has constituted the chief source of supply, but during recent years it has become more and more difficult to obtain an adequate supply from this source, and interest has centered on certain promising deposits in other parts of the world. In view of the decreasing supply from Iceland, together with an increasing use of optical instruments, it seems to be an opportune time to describe the known deposits; and to discuss the extent of activities, possibly improvements in methods of operation, their probable reserves, and the quality of the product obtained.

Where Iceland Spar Is Found

The spar mine in Iceland is situated at Helgustadir in the eastern part of the island. The mine opening is about 345 ft. above sea level. Spar was first discovered in the first half of the 17th century in a stream bed, but little attention was given to it prior to 1650.

The country rock consists of a series of basalt-lavas in alternating beds of sound and decayed rock. The basalt has many joints and crevices in which are numerous small crystals of calcite. In many places larger openings occur, due to disintegration of the rock, and such cavities contain masses of reddish clay, the result of such disintegration. Crystals of high-grade Iceland spar are found embedded in the clay, and zeolites occur around the edges of the clay pockets. Where the spar crystals are unprotected by clay they are usually cracked and otherwise imperfect. The clay pockets vary greatly in size, and there are indications that their size increases, and that the size and quality of the calcite crystals embedded in them improve with increasing depth. If this condition is found to exist, it supports Eiriksson's* contention that the alteration of the basalts is not due to weathering, but to the action of heated ascending waters which probably also brought up the larger part of the calcite.

In 1919 the quarry was 100 ft. long and 72 ft. wide at the top, 55 ft. by 50 ft. at the bottom and about 52 ft. deep. No definite order or system of work has been followed, the clay pockets being worked out with picks and shovels wherever they could be found. The largest clay pockets containing the most beautiful crystals are found in the southwestern corner of the pit, where they are inclined to the northeast at a dip of about 40 deg. Undercutting in this corner has left a dangerous overhang of rock with no secure support. The spar crystals are variable in size, and many of them are too imperfect for optical uses. Aside from cracks and distortions the chief imperfections are air bubbles, including water, or streaks of clay and other foreign mineral matter. Operations ceased at the beginning of the war and water was allowed to accumulate to protect the crystals from frost or other injury.

It is evident that the present unsystematic method of development can be continued only with increasing difficulty and danger. The loose and open nature of the decomposed beds makes it practically impossible to maintain secure walls, particularly as frost action disintegrates the wall rock every winter. Furthermore,

*Eiriksson, Helgi H., "The Spar Mine at Helgustadir, Iceland," Trans., Inst. of Min. Engineers, London, Vol. 59, March, 1920, p. 56.

owing to the severe winter weather, operations can be conducted in an open pit during part of the year only, and crystals at or near the exposed surface may be damaged by frost action.

California Deposit Not of Great Depth

The occurrence of Iceland spar in the Warner Range near Cedarville, Modoc county, California, was first brought to the attention of the Bureau of Mines by James D. Patterson in 1920. No study of the operations has been made by any Bureau representative, but evidently a small amount of development work has been done and some high-grade spar produced. Reports indicate that the calcite occurs in veins or cavities varying in thickness from a few inches to several feet, the country rock being hard and heavy, probably a basalt. Nearly all the pockets or cavities contain crystals of Iceland spar, the larger crystals occurring in soft decomposed rock of the consistency of clay. Where operations are now conducted the loose earthy material is about 5 ft. thick between walls of hard rock. The crystals occur in the loose material, some of them having a reddish earthy coating. They vary in size from that of a marble to 60 or 80 lb. in weight. Nearly all of the clear crystals have a burnt appearance, and ring like clinkers when struck with a hammer. Some of them exhibit twinning. No definite information is available as to the extent of the deposit. Mining is conducted by the open cut method, and it seems probable that this is the most feasible as the ledges containing the best crystals apparently do not extend to great depth.

While the percentage of flawless crystals is low, such crystals are of excellent quality. They are found to give satisfactory service in optical instruments, and the deposit therefore promises to constitute an important source of supply of optical spar.

Considerable Spar Found in Montana

The deposits near Greycliff and Big Timber in Sweet Grass county, Montana, were first noted by the Bureau in 1916. From samples received the material seemed to be of sufficient importance to justify examination, and Dr. S. C. Lind, a member of the staff of the Bureau of Mines Experiment Station at Golden, Colo., visited the region in August, 1918. Most of the information concerning the deposits as given in the following paragraphs has been compiled from Dr. Lind's report.

A deposit from which considerable spar has been obtained is situated about 11 miles southwest of Greycliff, which is on the main line of the Northern Pacific Railroad about 71 miles west of Billings. A second deposit occurs about a mile further in a southwesterly direction. About 10 miles west of Greycliff and four miles from Big Timber is a third deposit.

It is reported that Iceland spar was first discovered by W. E. Burch in 1907 or 1908 at the second location mentioned above. A shaft was sunk to a depth of about 75 ft., and approximately 30 or 40 tons of calcite taken out. From this amount about 600 lb. of the best crystals were shipped to New York and ultimately to Germany. About a mile from this shaft two small openings were made by R. H. Cartwright, and a few pounds of the best crystals obtainable sent to London, England, and to Philadelphia. No report as to the adaptability of the material for optical uses has been received from either source.

The spar occurs in two parallel vertical veins striking northwest and southeast. One is about 7 ft. and the other 5 ft. in width, and they evidently extend for several miles, maintaining their width and direction with remarkable constancy. The veins probably extend to a depth of at least several hundred feet and there is evidently therefore a very large supply of spar in reserve. There is practically no overburden, and crystals may be obtained near the surface at almost any point on the veins. Calcite crystals constitute almost the entire vein matter.

Chemically the spar is practically 100 per cent calcium carbonate, but as regards optical properties no absolutely perfect crystals were observed at any point. The imperfections are of three kinds. In the first place some crystals are affected with a slight cloudiness or milky turbidity in their interior. This cloudiness affects only a small proportion of the crystals, and is not therefore of serious moment. The second type of defect consists of incipient cleavage cracks in the interior of the crystals. It affects most of the material thus far obtained, and thus renders a large proportion of the product unfit for optical uses. It is not yet clear whether the cracks are inherent in the crystals or whether they have been induced by rough treatment in the process of mining. In the third place many of the crystals show repeated twinning, the visual evidence of which consists of bands of bright rainbow colors, which appear when the crystal is viewed in transmitted light at an oblique angle, though such bands may be due also to air films in incipient fractures.

Testing for Defects

The presence of defects due to twinning may in some crystals be readily tested by anyone with the aid of no equipment except a sheet of white paper. If a small clearly defined dot is placed on the paper and a cleavage fragment of Iceland spar placed over the dot, two dots will ordinarily appear a short distance apart, due to double refraction. If, however, the crystal is moved slowly back and forth and the dots observed closely, additional indistinct dots may also appear in certain positions. Such a phenomenon is an indication of twinning, and crystal fragments which exhibit it are defective for optical purposes, unless the individuals which constitute the twinned form are large enough for optical parts to be cut from them without passing beyond the plane along which such individuals are united (the composition face). In searching for any such evidence of twinning observation should not be confined to one direction, but should be made in the three principal directions through the three opposite pairs of parallel faces.

Some doubt exists as to the possibility of using Montana spar for optical purposes. One of the largest consumers of Iceland spar in America has tested two unrelated shipments from the deposits and has stated unreservedly that in view of the defects mentioned it cannot be applied to optical uses. The Bureau of Standards has, however, examined some of the same crystals, and has expressed the opinion that small Nicol prisms could be cut from the larger twinned crystals, and also that the turbidity does not impair the value of the crystals for certain unspecified uses. During 1918 and 1919 J. P. Rowe operated on one of the deposits and the claim is made that he has sold several pounds of optical spar, and had orders for a considerable amount. This would indicate that the material can be used for optical instruments.

Methods of Mining

The method of mining that has been pursued in the past consists in shattering the vein matter with blasts, working it out with picks and shovels, and breaking up the spar masses with small hand hammers. This rough treatment may account for a large proportion of the incipient fractures in the finished product. The use of explosives in material that is so easily shattered as crystallized calcite cannot be too strongly condemned. Marble, which consists of crystalline calcite, is with scarcely an exception quarried by means of channeling and wedging, and without the use of explosives, and as incipient fractures are much more deleterious in optical spar than in any structural material, the use of explosives should undoubtedly be dispensed with entirely. The best method of mining could be worked out only by careful study of the deposit itself, but the suggestion is offered that channeling machines such as are used in limestone and marble quarries could be used to advantage in making wall cuts along the sides of the veins. Masses could then be readily removed by drilling and wedging, and all subsequent reduction in size of fragments could probably be accomplished to best advantage

by means of wooden wedges and mallets. If the scope of operations is too small to justify the expense of a channeling machine, a method of wedging in drill holes might be worked out. It is believed that operators fail to realize the perishable nature of the product sought and the necessity for the exercise of extreme care in every operation.

Some of the difficulties encountered in developing the Montana deposits may be enumerated:

(1) Operations in the past have been conducted for the most part with very limited capital which has not permitted the employment of proper methods or equipment.

(2) Due to lack of appreciation of the fragile nature of Iceland spar, and familiarity with metal-mining methods only, the spar has been blasted and otherwise roughly handled to such an extent that much of it has been impaired by fractures.

(3) A very small part of the gross production is of optical quality, and great difficulty has been encountered in disposing of the lower grade material.

The disposal of low-grade spar is one of the most difficult problems involved. Small, clear crystal fragments may be sold to museums or to schools and colleges for illustration of optical properties. Also a limited quantity of pure material may be sold for use in preparing standardization solutions employed in volumetric analysis. Both of these uses probably do not require more than a few hundred pounds a year. Pure calcium carbonate is used for other purposes, as in the manufacture of high-grade glass, but for such uses its optical properties are not utilized, and any form of granular or opaque calcite of the requisite purity is equally valuable. Many limestone and marble deposits afford such a product, and consequently there is no justification for the added transportation expense involved in utilizing the Montana spar waste. If some practical outlet could be found for the smaller cleavage fragments and the defective spar it would greatly simplify the problem of development in Montana.

All information available points to the fact that sufficient investigation has not yet been made of the Montana deposits to establish conclusively their real adaptability for use in optical instruments. To accomplish definite results further development work should be done, and preferably at greater depth, for the quality of the crystals may improve with depth, though this has not been established. Also the work of excavation should be conducted with the utmost care. The best crystals obtainable should be submitted to the Bureau of Standards and to the leading optical companies for careful investigation. The suggestion has been made that the larger masses of spar might preferably be shipped intact so that the process of subdivision might be conducted by those skilled in cutting and handling Iceland spar. A careful and thorough investigation of the optical uses of the spar is the first step that must be taken before attempting any comprehensive scheme of development.

About 1912 or 1913 a small amount of Iceland spar was produced in Spain and shipped to Germany by Felipe Azcarate, of Bilbao. Information at hand indicates that the only shipment from this source to America was rated by the shipper as third-class spar. It proved to be unsuited for optical uses, and according to report American firms have had no opportunity to test the quality of the first-grade spar. Shipments of spar to optical companies in Germany would indicate the existence of a deposit of some importance. It is reported that preparations for working the mine on a greater scale were under way when the war broke out, but no information has been received as to the location of the mine, the extent of the deposit, or recent developments.

Spar Deserves Investigation

Specimens of Iceland spar obtained in Buenos Aires, Argentina, South America, are now being tested to determine their adaptability for optical uses. The spar appears to be of sufficiently high quality to justify a thorough investigation of the source of supply. No information is yet available regarding the location or extent of the deposit.

Three Generations of Morrises

HERE is a company that has been in the rock products industry continuously for the past 54 years, with three generations now in active service, including its founder, President A. G. Morris, who is approaching his ninetieth year—truly a remarkable record of service and achievement. Associated with President Morris are his son, Charles A., who is assistant to the president, and Charles' son, Elliott L., familiarly known as "Bud."

"THE SPIRIT OF '22!"
Reading from left to right—Elliott L. ("Bud"), Charles A., and A. G. Morris

The secretary and treasurer is J. King McLanahan, Jr., and F. W. Craft is superintendent of the plant. The present company is the American Lime and Stone Co., of Belleforte, Pa.

President Morris' achievements have been many since he first departed from his original vocation as millwright and carpenter. His introduction to the rock products industry was when he shipped the first limestone supplied to the Pennsylvania Salt Co., for making soda ash. This was in 1866. The Cambria Steel Co., got its first shipment from Mr. Morris, and today it is receiving 11 tons daily. His early drilling experience stood him in good stead when he drilled the first oil well in Pennsylvania. He also shipped hydrate to India some 40 years ago, and he put in the first Gates crusher in America. Mr. Morris was the first to employ dynamite for blasting—in the days when that explosive cost 75 cents a pound.

Charles A. Morris was for years engaged in business in the South. He joined the firm several years ago.

"Bud," the sturdy grandson, did his part in making history for our country by serving in the aviation corps in France, and was a close friend of the American ace, Eddie Rickenbacker.

The present company reports an excellent business—as well it might with President Morris' 54 years of fine accomplishment behind it. With its 80 kilns this company has a capacity of 100 cars of lime and stone daily.

Our industry is mighty proud of Mr. Morris and his remarkable record, and Rock Products voices the industry's warm admiration and esteem for him and his life work.

A Pioneer in the Lime Industry

He Is George B. Wood of Rockland, Maine

By Nathan C. Rockwood

WHEN men leave the beaten paths of their neighbors and branch forth into the unknown, unmapped wilderness, the world calls them pioneers; and admires their enterprise and courage. When men strike out from the well-known paths of knowledge in science and engineering and explore new ground and develop new knowledge, they are termed pioneers of science and industry; and to them the world owes all its material progress.

Every industry has its pioneers, and the lime industry is no exception; but most of the pioneers of the lime industry must be credited to the centuries before Christ, since few essential changes have been made in the *modus operandi* of lime manufacture since the times of Vitruvius.

To be sure, we have the separately fired kiln and the rotary kiln, but the latter is an adaptation from cement manufacture rather than a development of the lime industry, and the former did not dispense with the skilled old lime burner and his pyrometric eye, nor the age-old method of manhandling the raw and finished materials.

Now we have a real pioneer in the lime industry exploring the unknown field wherein is to be discovered the secret of making lime automatically in scientifically controlled apparatus. That man is George B. Wood, president of the Rockland-Rockport Lime Corporation of Rockland, Maine.

While of much shorter experience in the lime industry than many others, he came into it well equipped with an engineering education and experience—and the courage and philosophy of a real pioneer.

The keystone of Mr. Wood's philosophy is that when a thing—a machine or a process—is correct in theory it can be made to work out satisfactorily in practice if you work at it hard enough and long enough. He is too good an engineer not to have ascertained that the theory of the new Rockland lime plant was correct before he started it. He has the satisfaction, and the work, of making it perform as it was intended to.

The writer visited Rockland early in May, saw the plant in operation, and learned of some of the changes that have been made and why they were made. He came away with two very vivid impressions: (1) that the Rockland plant is going to be the pacemaker of the lime industry, and (2) that George B. Wood is a man and an engineer among a million.

Mr. Wood is a graduate of the Massachusetts Institute of Technology and an experienced mining and mechanical engineer. He has plenty of faith in engineering and in engineers.

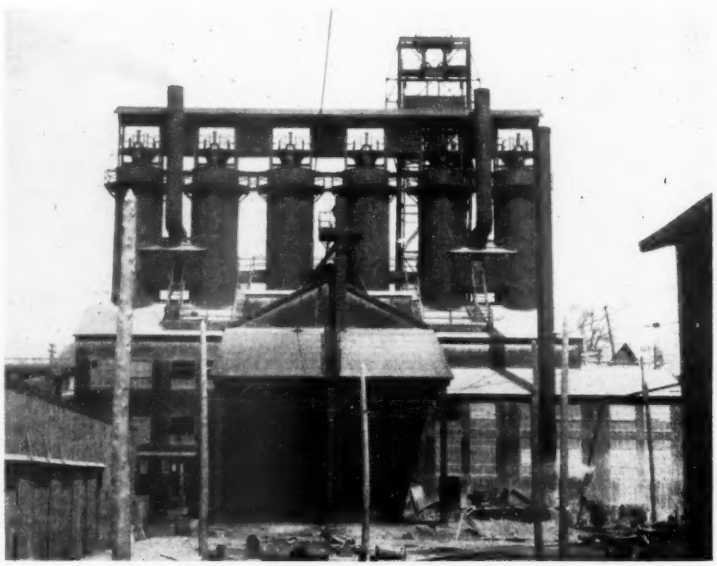
W. D. Mount, the engineer who designed these kilns, in a letter to the writer says: "In all my business experience I have never have met a fairer and more open-minded man than Mr. Wood; nor one with whom it has been a greater pleasure to work."

George B. Wood, president of the Rockland-Rockport Lime Corp.

There are many problems and details to be worked out before the Rockland plant will be all that it is intended to be, but it is today unquestionably the most interesting development in the industry and the plant above all others where information about lime manufacture is going to be developed. The kilns will in time be capable of the most delicate manipulation, and with such manipulation will come a world of new knowledge about lime and the factors which affect its qualities.

In Mr. Wood the lime industry and the engineering profession have a man who can think steadily and dig deeply into problems and difficulties the like of which have caused many another man to throw up his hands in despair and start anew—the very fate of most previous attempts at innovations in the lime industry.

Want of space in this issue of Rock Products prohibits going into the details of the operation of the Rockland plant at greater length, but the next issue, June 17, will contain a host of interesting illustrations and data of much interest to every lime man.



The new plant of the Rockland-Rockport Lime Corp. in operation

The Removal of Clay from Sand and Rock

This installment sets forth the importance of choosing a method of washing samples based on a sound knowledge of the theory of washing if one is to be certain of his results. Several methods of washing are here explained, and the superiority of one over the other

By Edmund Shaw, of the Allen Cone Co., El Paso, Texas

IT is quite possible that the reader may find something with which to disagree before he finishes this ninth installment, especially if he has had much experience in sample washing. For the washing of samples is not an exact art, and something has to be left to one's judgment. Something has been written on the subject, but in all that the writer has seen the details of manipulation, etc., are treated somewhat sketchily. It is the details that count in getting results, and as every man works out the details of his method from his own experience, he is apt to overvalue a certain detail which to another would seem of minor importance.

The important matter, in the writer's view, is to remember that one is not trying to follow a particular series of operations so much as he is trying to obtain a particular result. If he is washing samples to report on the test pit sampling of a property, one method will do. If he is making tests to determine the amount of water to be used and the other details of the design of a new plant, another method altogether may be preferred. If he is testing the waste waters of a plant to see what the losses are, still another method may be used. But whichever method is chosen, it must be based on a sound knowledge of the theory of washing if one is to be certain of his results.

Only Simple Apparatus Required

The apparatus required is the simplest, and none of it is expensive. The first requisite is a supply of clean water, and a short piece of hose makes the most convenient appliance for using the water. In the field one has sometimes to dip water from a nearby pool or stream, but the results will be just as good with the hose if one is careful. After the water supply, the ordinary 10-qt. galvanized-iron pail is a man's best friend. It holds almost exactly ⅓ cu. ft., which makes it a very good measure. It will contain 19.83, lb. of water, so the contents may be taken at 20 lb., for ordinary work. The empty pail weighs 2 lb., a handy weight for subtraction. For weighing samples that run into pounds, the writer uses an ordinary spring balance that will weigh from ½ oz. up to 24 lb., because his work requires a balance that is portable. It has been checked and found to be as accurate as it can be read. The best screens for rough work are home-made, with wooden frames, 18 to 24 in. square. Tubs and good-sized pans to hold samples have to be added to make the equipment complete for the washing of test pit samples and the like.

For inside work on small samples one requires a sink with a water-tap and a work bench—a kitchen table will do. There must be a set of screens and a balance which will weigh to 1/10 gram. The balance should have the metric system weights to obviate tedious calculations. For washing fine sand samples, the best vessels the writer knows of are the 2-gal. glass jars sold as battery jars. Some good-sized beakers, a few gfraduated glass cylinders (in centimeters, and a few pieces of glass rod will be needed, and a stove for drying samples. A gas stove is best, but a gasoline or kerosene stove will do very well.

How to Select the Sample

Before starting a description of the sample washing, it may not be amiss to say a word or two about the sample itself. To be of any value, this sample must be representative, or so marked that anyone may readily judge its value. One swallow does not make a summer, and the sample from a single test pit does not give a fair sample of the whole deposit. If a plant is losing a lot of fine sand at 3 o'clock on an afternoon when everything is being rushed, it does not indicate that the same loss is going on all day or throughout the week. Such things should be considered when the report on the sample is made.

Let us take for the first example the samples from test pits, from which we are to determine: (1) oversize, which will require crushing; (2) gravel from 2 down to ¼-in., and (3) sand which is minus ¼-in. If there are intermediate sizes, these may be determined by screening the washed sample after drying.

We will want our results in pounds per cubic yard, since the crude material is measured in yards and the washed material is, in almost all cases, sold by weight. We will first measure the test pit to determine how many yards (in place) there are in the sample. Next we must remove the oversize by shoveling over a bar screen or by picking out the oversize lumps. We may weigh these or estimate the weight by measure, but in either case we are able to report the pounds of oversize per cubic yard at once.

We have next to take out samples for washing, and here is where one must exercise his judgment in taking a fair sample. The safest way would be to wash all of the material, but this would take a lot of work. The average of two or three well-chosen samples will give a dependable result, which is all that we are after.

A 10-qt. pailfull, which is the third of a cubic foot, makes a good sample. A part at a time is dumped into the ¼-in. screen, which is supported on two sticks over a tub. The water is turned on through the hose and a gentle stream is used to wash through all the sand and clay. In this way the sample is split into gravel (which is set aside to dry) and sand, which remains with the clay in the tub.

The sand is thoroughly stirred up with the clay and water and given just time enough to settle, and then the clay and water are siphoned off with a short piece of hose. An alternative method is to pour off the water carefully, so as to leave only the sand behind. More water is added and the process is repeated until the water shows only a little color of clay, and then the sand is scraped and rinsed out into a pan and set aside to dry.

If we are dealing with a substance like phosphate rock, which is sold as dry as

possible, we must be careful to dry thoroughly, but concrete sand and like products do not require thorough drying since they are sold in a moist condition. Overdrying is better than underdrying, as it reduces the weight of the product and gives a margin of safety.

Weighing the Output

Weighing the product gives us the output in pounds per cubic foot or yard, but in making the calculation we must remember that the oversize which was thrown out at first occupies space, and we must reduce our results in proportion. We may calculate the space occupied by the oversize from its weight by remembering that 1 cu. ft. of ordinary rock weighs 162.5 lb. If we find that the oversize occupied 12 per cent of the total space, we must take only 88 per cent of the result we obtained in washing as the pounds per cubic foot or yard in the deposit.

This sort of washing is simple enough, as we do not have to pay attention to the amount of water used or to determine the percentage of clay. Before the plant is built, we shall want to make some washing tests to find out how much water is to be used and to determine the required settling area and other matters which we will not consider here since they belong under the heading of Plant Design.

If we know the percentage of clay present we may *calculate* how much water will be required to wash it out, down to a certain percentage of residual clay, as has already been explained in these articles in discussing the theory of washing. It does not take anything from the value of such figures to say that they should be checked by washing tests, and that such figures are really only a starting point from which to begin the testing work. There is more to washing than theory and a soft lead pencil. One wishes actually to see the tests and to note the behavior of the material while it is being tested. The more we handle and work with material which is to be washed, the better we become acquainted with it, and all that we can learn about it will be useful when we come to design the plant. Hence the beginning of both calculation and testing is the determination of the clay in the crude material, and this will be the first thing described.

Three Ways to Proceed

For the moment we will pass by the method of obtaining the sample, and say that our sample consists of sand and clay mixed with considerable water. There are three ways by which we may proceed after we have decanted off the excess water:

1. Dry the sample down and take a known quantity, as 500 or 1000 grams. Then wash out the clay and dry the clean sand and weigh it. The difference in weight between the weight of the sand and that of the sample taken is called the weight of the clay.

2. Weigh out two wet samples of the same weight. Dry one and wash the clay out of the other and dry the clean sand remaining. The difference between the dried sample and the weight of the clean sand is called the weight of the clay.

3. Take an unknown weight as a sample and wash out the clay, saving all the washes that contain the clay. Decant off the clear water from the settled clay, evaporate the rest and dry and weigh the clay. Then dry and weigh the clean sand. The sum of the two weights is called the total weight of the sample taken, and the weights of the clay and of the sand are figured as a percentage of this weight.

The first method is one that is often given in books. The writer does not like it, as it calls for drying the clay with the sand before washing out the clay. It is his experience that in drying the clay is baked on the grains, which makes considerable scrubbing necessary to remove it. With a hard, coarse sand this might not matter so much, but with a friable material like phosphate rock there is more than a little loss from so much scrubbing. A further objection is that the clay is somehow changed in the drying, and it washes out differently from the clay in the undried sample.

The second operation introduces a chance for error, as the two wet samples could hardly be of exactly the same dry weight. But it is a faster method, as the washing can go on while the check weight samples are drying. For rough work, or where a number of samples are to be averaged to obtain a result it will do, but not otherwise.

The third method is the most accurate, especially if the whole sample is washed. But it requires a lot of space in which to save all the washes, and it is a nuisance to handle so much water for so small an amount of clay. The clay has to be dried slowly to prevent loss by "spitting," and it is a tedious job to clean the dried clay from the dishes, either before or after weighing.

To give an idea of the manipulation required in the clay determination, the washing out of the clay from the sand in the waste waters of a Tennessee phosphate plant will be described. This is perhaps as difficult a material to wash as will be found anywhere. There may be 10 or 20 times as much clay as sand present, and the sand is very fine, much of it finer than 200 mesh. There are bound to be some losses of fine sand in washing such material, using all possible precautions, but careful work gives results that check closely if duplicates are made.

The sample of waste water is brought into the laboratory in a bucket. It is stirred very thoroughly with a stick, care being taken to see that all the settled sand is stirred up from the bottom. While it is still well agitated a sample of 1000 ccs. is taken out and weighed for specific gravity. A table shows the approximate percentage of solids from this weight, but as a check a second sample is taken out in the same way and dried down to give the weight of the solids.

The first sample is poured into one of the 2-gal. battery jars before mentioned and the jar is filled with water, leaving just enough space so that it can be stirred without slopping over. After it has been thoroughly stirred it is allowed to settle for 10 minutes. All the sand will be settled in this time, but the greater part of the clay will still be in suspension. The clay and water are carefully siphoned off with a half-inch rubber hose, taking care not to pull off the last of the water too fast and not to go too deep with the hose. About 1 in. of water is left on top of the sand. The filling, stirring and settling are repeated as many times as are necessary, the last water containing only a tint of clay. Then the sand is washed out into a pan, the excess water carefully drained off, and the sand dried and weighed. The dry weight of the second sample taken will be the original weight of the sand and clay. Report is made of the specific gravity, percentage of solids in the waste water, percentage of clay and percentage of sand, and this is calculated to daily loss in tons.

It will be seen that this follows the second method just spoken of, but it may be safely used in this case, as daily samples are taken and the loss is figured as an average at the end of the month. There are other ways of checking this loss and special check samples are taken from time to time. As these check very closely, the method is considered accurate.

Care in Drawing Off Clayey Water

The greatest care has to be exercised in drawing off the clayey water. The end of the siphon is held just below the surface of the water and follows it down, and the discharge end of the siphon is pinched to make a very slow current as the sand is approached. If this is not done one can see the fine sand rising and going into the siphon when the water gets down within an inch or two of the sand. After the clean sand has been washed into a pan, the excess water must be carefully decanted. It is better to leave a little to be evaporated rather than to pour off too much and lose some of the fine sand.

Washing Concrete Sand

In washing such a material as concrete sand no such care has to be taken, for the sand settles rapidly to a firm mass, and the clay can be poured or siphoned off without a chance of loss. Moreover, the very fine sand (which is the principal source of loss in the waste waters of a phosphate plant) is not wanted in concrete sand, so it should be washed out with the clay. The test may therefore proceed rapidly.

The taking of the sample was passed by—it really has no connection with the washing—but a word or two regarding it may not be out of place. If one is sampling the waste water to determine losses, the only fair way is to sample at regular intervals, combine all the samples, and then to take a sample from the combination. A single day's sampling is hardly enough if results are wanted, for example, to determine if additional recovery devices are needed. In all testing work of this kind the first lesson one has to learn is to do plenty of testing and not to jump at conclusions.

If the sample is one that has been taken from a test pit, the clay and sand should be washed through the screen, as has been described. The mixture of sand and clay in the tub is the sample from which the clay content is to be determined and the percentage of clay may be figured back to the sand, the washed or to the crude material in the bank.

In the first sample washing described, the result wanted was the amount of product to be recovered per yard, in the next it was the percentage of clay which had to be removed. In the last the result wanted is the amount of water which will have to be used to make a merchantable product from the crude material in the deposit. In the first two, it was the results, expressed in terms of weighed product, in which we were particularly interested, but in the last the process itself is of interest. We want to observe several things, as for example, if the clay in the deposit will form clay balls or if it will adhere so firmly to the grains as to necessitate a great deal of scrubbing. While the settling area may be figured out in advance, we should have some data with which to check our figures.

Much to Learn from Laboratory Tests

Much may be learned from tests of a laboratory size, especially if they are made by a man who has had considerable practical experience and who knows how to recognize the importance of details. But if the tests are to be made to determine the design of a new plant, it is better to make them on as large a scale as possible, so that they will more nearly approximate commercial work.

It is far too often the case that these large scale tests (or tests of any scale) are omitted. A common practice is to take a chance and put up a plant something like the one someone saw somewhere, which may have been a good plant for the particular conditions that it had to meet, but which was quite unsuited to other conditions. The result is that many a plant has had to have more than its first cost expended upon it in the way of alterations and additions before it would do anything like the work expected of it. Sometimes even this would not save it, and the plant had to be abandoned altogether.

On the other hand, one recalls with pleasure certain well-designed little testing plants, capable of giving accurate results on a scale large enough to be assuring. One such is a sample washer which the writer saw in the Florida phosphate field. It was only a good-sized box or tank with screens mounted in it, but it was so arranged that the entire plant process could be duplicated. The clay balls and trash could be taken out by the regular large mesh screen and the quartz sand separated by a fine screen, just as in the plant. The water flow could be measured and the tailings or reject could be caught and examined and weighed. Sufficient scrubbing could be given by the screen action. When a test was put through all the results could be had with the minimum of guesswork.

Cheapness of Testing Plant

Provided that water under pressure is obtainable, as from a city water main, a sufficient little testing plant may be put up quite cheaply. Let us suppose that a sand and gravel deposit is to be tested. The plant would need to have a small receiving hopper into which the samples could be dumped. A well-placed jet would give the disintegrating action necessary. From the hopper the material would run out on to gravity screens with spray pipes above for separating the oversize and the sizes of gravel required. A settling box, not too large, would catch the sand, and it would be useful to have all the water used caught in a tank for the purpose of measuring it accurately. But this would not be essential, as the water flow could be measured and the time taken.

The writer saw two such testing plants which were erected last fall as a basis for building a plant this year. In one case, where pressure water was not available, the prospective plant builder bought a small centrifugal pump and connected it to a gasoline motor, which he took out of an old truck. In both instances the testing work was of the greatest importance, for the plants had to produce sand that would meet certain specifications, and if it could not meet them there was no use in building a plant. In one case a plant has been built which is producing sand fully up to the required specifications, and the sand is being sold about as fast as it can be produced.

Amount of Water Most Important

Whether the tests are performed in the laboratory or in a testing plant, the first and most important thing to determine is the amount of water to be used. It is supposed that the percentage of clay has already been determined, and this gives us a starting point from which to begin our tests. If we find that by using the calculated amount of water we can obtain the results calculated, everything is well, although enough tests should be made to thoroughly confirm the first. If we do not find the residual clay in the washed sand as low as it has been calculated to be, we must investigate farther. It may be that more scrubbing is needed. It may be that we have simply made a mistake, either in the calculation or the test. In any case, we must keep on until we find the difficulty and set it right.

It is here that one's practical experience comes in. It is an easy matter to scrub a small sample in the laboratory, but it is a hard matter to scrub a large tonnage of the same material as it passes through the plant. Even the matter of applying the water in a single wash requires judgment and experience if it is to be applied as it would be in the plant.

It has been mentioned that the observation of such tests is worth a great deal, but it is not to be understood that too many things are to be looked for or determined in the same test. There is an excellent rule for all sorts of testing which tells us never to determine more than one variable at a time, and if we are trying to determine the water to be used we should not concern ourselves too much about the settling area, say.

If it is necessary to go beyond a single wash, the water should be used in accordance with the theory of successive washes, which has been explained in previous installments. To go into this would be merely to repeat what has already been said. If one is not acquainted with the theory of washing, he should study it thoroughly and understand it before beginning any testing work.

Of course, nothing of what has been said of washing tests for the water required applies to those fortunate persons who are working river and other under water deposits by dredges. The water problem does not bother them, except as they find they have too much of it and need to provide unusually large settling areas. It is not often that they have problems which must be solved by scrubbing or disintegration.

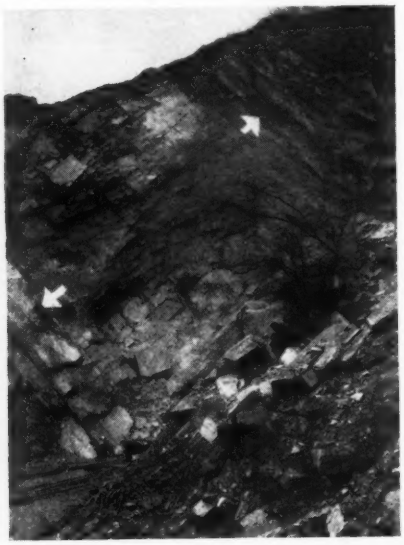
(To be continued)

No More Waste Stone

By Charles A. Morris
Vice-President, American Lime and Stone Co.

Day or night, rain or shine, summer or winter, the American Lime and Stone Company is assured of an unfailing supply of clean high-grade limestone from its recently completed mine, and every particle can be burned in its new rotary kiln, which is adapted to either the dry or the new semi-wet burning process

WE wanted to do away with our waste heap. Every lime manufacturer, I suppose, would like to be able to burn 100 per cent of his stone, and do away with the expensive hauling and dumping of large quantities of material which has been made worthless by poor quality stone or earthy overburden mixed with it. Besides, we wanted to make our operation independent of weather condition, especially so we could be sure of material for continuous operation of a rotary lime-burning kiln which will soon be ready for operation.

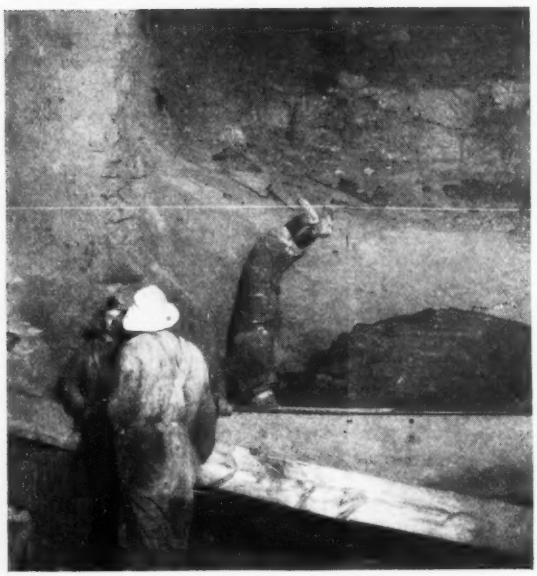


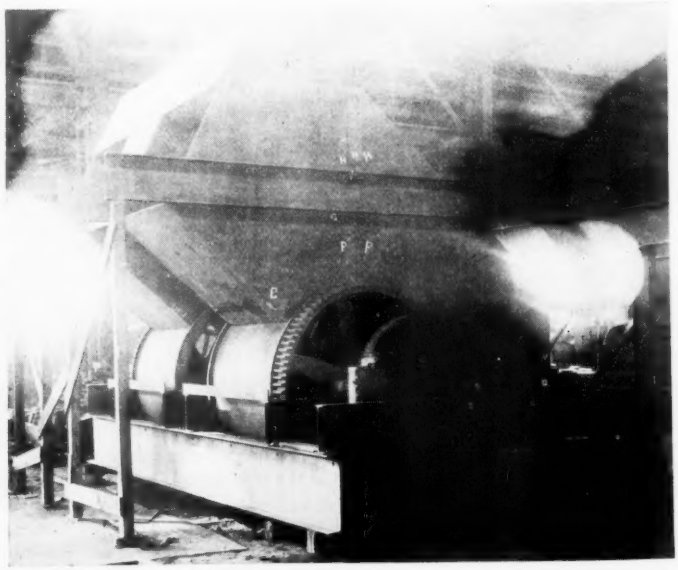
Both these objects have been accomplished by sinking a shaft into our deposit of good stone and taking out the stone by mining methods.

We have in the Bellefonte district about 12 quarries operating, all taking stone from the same vein—a vein 77 ft. thick and running into the earth a thousand feet or more. This stone is more than 98 per cent calcium carbonate, and is the only good stone for burning. Adjacent veins are good for crushed stone and stone products.

Our No. 3 quarry had been worked so far that a heavy overburden—40 ft. or more—continually threatened our vein of

The 77-ft. vein is shown between the arrows at the left. At the right is the skipway in the shaft at the loading pocket level; at the left below is the excavation made to receive the loading pockets; and at the right below are the loading pockets during their test in the shop





good stone. Slides were frequent, in fact, and all material contaminated with any of this loam had to go to the waste heaps. This caused costs on the usable stone to mount continually higher, and to meet the situation we decided to open a mine. This would give us a product absolutely free from foreign matter; every ounce of rock mined could be burned, and our waste piles would stop where they were. And weather conditions, which are the bane of every open quarry operator, would no longer have any terrors—rain could not interfere with operations in spring, summer, and fall, nor snow, ice, and cold weather during the winter. A fairly uniform temperature varying but a few degrees from 55 deg. will be encountered in the mine.

We know of course that it will take more drilling and more powder in the mine than in the quarry to remove an equal amount of stone, but there will be no stripping, no snow to clean off, no mixing of low-grade rock, clay and dirt with the high grade stone.

The advantages, we believe, will much more than offset the disadvantages, and the cost of good stone from the mine will undoubtedly be lower than the cost of good stone from the open quarries. The mine is practically ready to operate now, but of course it will be several months before an accurate and reliable idea of costs can be gained. But our guess, based on reliable knowledge and calculations, is that costs will be lower.

At any rate, the mine will furnish a continuous supply of clean, high grade stone for our new rotary kiln, and such an unfailing supply is essential in a rotary kiln.

When it is in full operation the mine will increase our output of stone by 40 per cent, raising it to more than a million tons a year.

All that remains to be done on the mine is the completion of the loading pocket installation. Before the first of July, unless the unexpected occurs, stone will be coming out of the mine.

The 77-ft. vein is at an inclination of 52 deg. where it enters the ground at No. 3 quarry, and at point about 175 ft., below the surface. This inclination becomes steeper until at 200 ft. and beyond the inclination is 63 deg.

The shaft of the mine was sunk about 90 ft. back from the edge of the good stone vein, and cross-cuts run from four levels forward into the good stone. The shaft is 8x24 ft. and follows the natural inclination of the 8-ft. limestone stratum in which it was sunk, taking the dip from 52 to 63 deg. between the second and third levels. Four compartments are provided in the shaft for two skipways, a cageway, and a ladder. On the incline the shaft is 390 ft. deep.

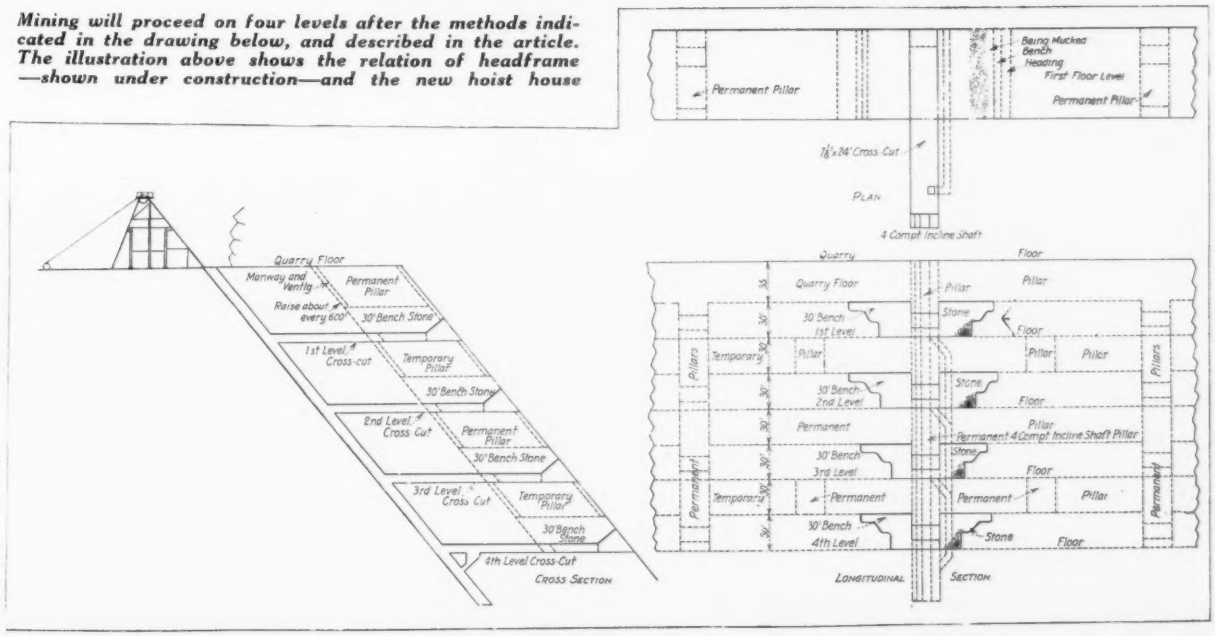
The horizontal crosscuts are 7½x24 ft., and extend from the shaft into the good stone ledge to a slip in this ledge which will form the hanging wall of the stopes. The first crosscut is 65 ft. below the quarry floor, and the other three are at intervals of 60 ft. below the first.

Just below the fourth level is a storage and loading pocket of 250 tons capacity to which the stone from all four levels will be chuted, and from which all stone will be loaded into 5-ton iron skips and hoisted out of the mine.

The diagram shows the general arrangement of the shaft, the crosscuts, and the loading pocket. It shows also how the stone will be mined and how the raise will carry it to the loading pockets.

The stone above the crosscuts will be left as a pillar, and on each side will be opened a stope 30 ft. high. After the first opening has been made a pilot drift will be carried ahead at the top of each

Mining will proceed on four levels after the methods indicated in the drawing below, and described in the article. The illustration above shows the relation of headframe —shown under construction—and the new hoist house



stope. A heavy mechanical shovel will load the stone into cars which will be hauled by electric motors to the raise. While the shovel is loading on one side of the crosscut, drilling and blasting will push ahead the stope on the other side of the cut. By making the crosscut higher at the hanging-wall end the shovel can be transported from one side to the other on the same level.

The raise has been made approximately parallel to the shaft, and about 30 ft. from it, extending from the first level down to the loading pocket. The three upper levels each are connected with the raise, while a separate short raise will allow dumping from the fourth level to the loading pocket direct.

The mine was originally designed with a 90-ton loading pocket at each level delivering directly into skips in the shaft, but the additional expense of four loading pockets, the less flexible mine storage capacity, and the greater confusion and difficulty of loading from four points in the shaft instead of one seemed to make it advisable to chute all the stone to the bottom by means of a raise and then hoist it all from there.

The diagram shows how temporary and permanent pillars will be left as the mine is pushed each side of the shaft. The company owns property including the good stone vein a considerable distance each side of the shaft—enough to supply stone for many years from the four levels that have been opened. If it is ever desired, the shaft can be pushed down as far again as it is now and four or five more similar crosscuts pushed into the vein.

Not alone in its stone producing methods is the American Lime and Stone Company progressive. Its new plant—still not quite completed—for making every kind of lime is one of the most remarkable plants in the world for its flexibility of operation and for the new methods which will be used. The illustration above, showing at the left the hoist house of the mine, indicates how production proceeds in approximately a straight line from mine to loaded freight car. A complete detailed description of this new plant will appear in the next issue of ROCK PRODUCTS.

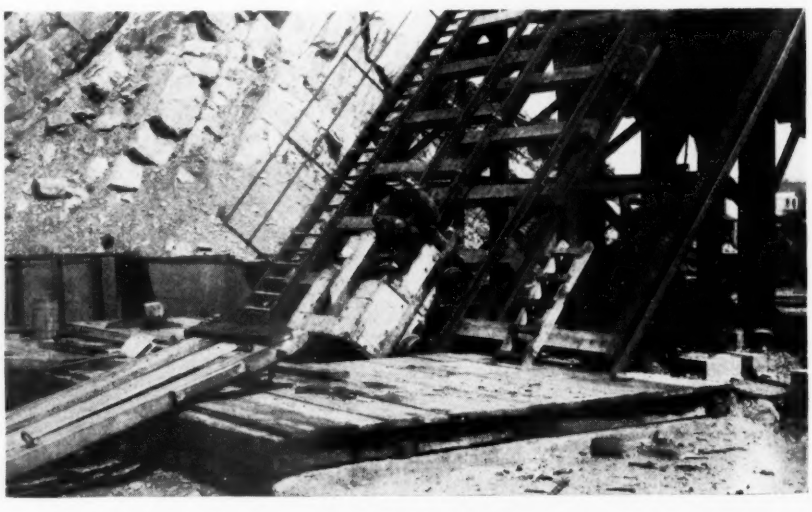
The hanging wall of the shaft is unsupported and is unlikely to ever need supports. A row of 8-in. posts with 2-in. plank separates the two skipways from the cageway and ladder.

The 5-ton skips run on 60-lb. rails laid at standard gage on 6x8-in. wooden ties, which in turn are supported on 8x8-in. and 8x10-in. wooden sills. A 3-ft. gage track will carry the car in the manway, and in the compartment with the ladder will be the water pipes from the pumps below and the air pipes from the compressor above.

The storage and loading pocket will have a capacity of 250 tons, and this can be added to by allowing stone to accumulate in the raise part way to the third level if desired. The loading pocket itself is of steel construction and is so arranged that it will deliver stone from either of two measuring pockets placed over the two skipway tracks. A revolving drum operated by compressed air feeds stone into the measuring pockets. The operator will be able to determine just how much stone should be fed to the measuring or chart bucket.

dump their loads. From ground to center of the sheave wheels is 55 ft. The bins hold approximately 400 tons of stone, and from them stone is drawn by pneumatically operated gates as shown in the illustration into cars below which trans-

Steel headframe and storage bins are combined, as this illustration shows



This shows the shaft opening and details of the headframe. The skip shown is a temporary one; the permanent ones are of heavy steel construction

port the material to the crushing plant.

An Ottumwa Iron Works hoist operates the two stone skips. This is housed near the head frame, and in the same house is the Ingersoll-Rand compressor with 20x14-in. and 12½x14-in. cylinders which furnishes the air for drilling.

The mine shaft, crosscuts, raise, loading pocket, and headframe and bins—in other words, everything ready to start mining stone except the hoist house, hoist, and compressor—represents an investment of $250,000.

The mine work was done by the E. J. Longyear Co., after plans prepared by A. Neustadter. The loading pocket and headframe were furnished by the Traylor Engineering and Mfg. Co.

Coal Cost to Drop with Freight Rates

IMMEDIATE reduction in the price for strike mined coal as the result of the lowering of freight rates by the Interstate Commerce Commission, was predicted by President Bradley of the National Coal Association at the annual convention of that body, held in the Congress Hotel, Chicago, on May 24 and 25.

The convention heard a number of reports dealing with government relations, foreign trade, policy, and the association's activities during the year. Each report brought out an interesting discussion that indicates that association members are eager to conduct the coal industry on sound business principles and under fullest co-operation with the Department of Commerce.

National Lime Association's New Secretary and Manager

THE new secretary and general manager of the National Lime Association is W. R. Phillips, who took up his duties on May 16.

Mr. Phillips' college training was in the field of civil and mechanical engineering at State College, Pennsylvania. Since 1906 he has had a wide and varied experience as a sales and construction engineer. Following a year with the government in dam construction, the next six years were in sales engineering work with the General Fireproofing Co., Columbia Concrete Steel Co. and Fletcher Brothers Co. in the Western Pennsylvania territory. In 1913-16 he was with the Austin Co. at Cleveland, during the latter period in charge of the Eastern division of their construction work. In 1917 he established his own construction company, with headquarters at Bridgeport, Conn., and carried on a large business up to the time business conditions brought about a slump in the construction field. During the war Mr. Phillips was civilian expert on industrial production in the Ordnance Department, in charge of production of certain types of munitions.

His experience has been more in the executive than in the technical aspects of sales and construction work, which is a phase of promotional work particularly applicable to an industry like the lime association, pushing its work along educational lines with a strong background of research and investigation. The lime industry has made very considerable progress in the last three years through its association in organizing the available information about lime and its uses and getting that data into educational form for the public. The future work of the association calls for a continuance of that

W. R. Phillips, secretary and general manager of the National Lime Ass'n

work, and especially for the active extension of its educational aspects through the development and extension of the field work in close co-operation with the technical staff in Washington.

Soft Stone Tests Show Good Results

SIXTY-DAY tests conducted by the Illinois Highway Department on specimens being experimented with in the investigation to determine the suitability of soft stone as a concrete road aggregate have checked with considerable consistency the results obtained in the 30-day tests. Though other characteristics of the materials used undoubtedly affected the results to some degree, the tests proved rather conclusively that the French coefficient of wear has little to do with the transverse and compressive strengths of stone in concrete mixtures.

Although no one soft stone example showed greater strength than all the other samples, hard stone included—as was the case in the 30-day tests—the average of the strengths of the soft stone compared very favorably with those of the hard stone. When it is considered that the French coefficients of the soft stone samples averaged less than half of the coefficients of the hard stone, there is little room for doubt as to the relation that exists between the French cofficient of wear and the strength factor.

The absorption qualities of the soft stone is thought to be instrumental in helping it attain high strength. A greater bond is secured in the soft stone than in the harder material, due perhaps to the character of the surface of the stone. Over 2 per cent absorption was found in the soft stone, while the hard material rarely showed over .5 per cent.

The following table gives an average of the results obtained in the 60-day tests:

French Coefficient of Wear	Modulus of Rupture	Compressive Strength
11.4	505	3680
13.3	712	5240
12.5	684	4106
13.3	656	4650
12.6 Av.	662 Av.	4170 Av.
4.8	615	4130
5.1	662	4750
7.7	706	4560
5.8 Av.	661 Av.	4480 Av.

"No Fertilizer Trust," Says U. S. Official

CHARGES that a fertilizer trust controlled prices, fixing them so high that the farmers are unable to buy quantities sufficient for their needs, were declared to be without substance by Francis L. Hawes of the Federal Trade Commission in testifying before the national Senate Agriculture Committee investigating proposals to develop the nitrate and power projects at Muscle Shoals.

Mr. Hawes also declared that since 1915, so far as the commission had learned since that time, there is "no combination in restraint of trade" in the fertilizer business.

Production of Calcareous Marl in 1921

THE output of calcareous marl in the United States in 1921 amounted to 53,730 short tons, valued at $183,743, according to reports made by the producers to the U. S. Geological Survey. The quantity decreased 45 per cent and the value 43 per cent as compared with 1920. In 1921 the average value per ton was $3.42; in 1920 it was $3.31. Nearly all the calcareous marl sold in 1921 was used for liming the soil. Some was used as a filler in patent fertilizers. More than 63 per cent of the total output—33,978 short tons—was produced in Virginia and was valued at $105,821. The other producing states were California, Maryland, New York, North Carolina, Ohio, Pennsylvania, South Carolina and West Virginia. Deposits were developed in Michigan and Wisconsin.

Hints and Helps for Superintendents

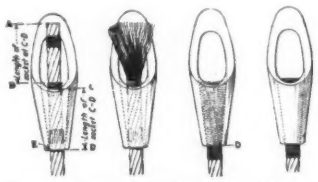
How to Socket Wire Rope

IT is far better, and much more economical in the long run, to employ in the beginning a steel rope that is from 25 to 50 ft. longer than actual initial requirements, according to Donald J. Baker, writing in *Coal Age*. Yet it is not uncommon to see the drums of hoisting engines entirely bare when the rope is paid out.

Stresses sustained in heavy and continuous hoisting, while having their effects on all sections of the rope, are more noticeable in certain places than others. That portion of rope adjacent to the socket, as well as that near or in contact with the shaft side of the sheave wheel when the load is at rest at the bottom, are subjected to more wear than is the rest of the cable. When the load or skip comes to rest at the bottom of the shaft, the rope is continually vibrating. The extremity or point of this vibration ends at the sheave wheel at the top and at the socket on the load itself.

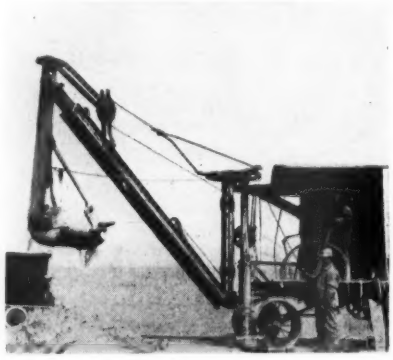
This is more wearing on the rope than the actual hoisting cycle. Not only is there a tendency on the part of the cable to stretch throughout its entire length at such times, but shearing forces are exerted on the strands at the socket. It is considered wise, therefore, to cut off and scrap, every six months or a year, 6 ft. or so of the rope nearest to the socket. The section nearest the sheave wheel will thus be lowered away from the point of undue stress, and consequently will not be subjected to any forces other than those exerted in a straight pull. It is always well to provide a drum that can carry the extra length of rope; otherwise in a few months it may be necessary to scrap the whole rope as too short for the service, as a result of having become worn out at its lower extremity.

Three seizings are put on the rope. The socket is carefully cleansed of paint and grease and rounded out smoothly at



Four Stages in the Socketing of Wire Rope

E. The rope is then passed into the socket as indicated at left. The end seizing is then removed, the wires are untwisted until they stand out like a broom, as in the second view, and the hemp core is cut as far as the second seizing. The wires are then thoroughly cleansed with gasoline and with hydro-chloric acid.



The rope is then drawn back as shown, and pure zinc at the proper temperature is poured in and allowed to set. Then the two remaining seizings are removed.

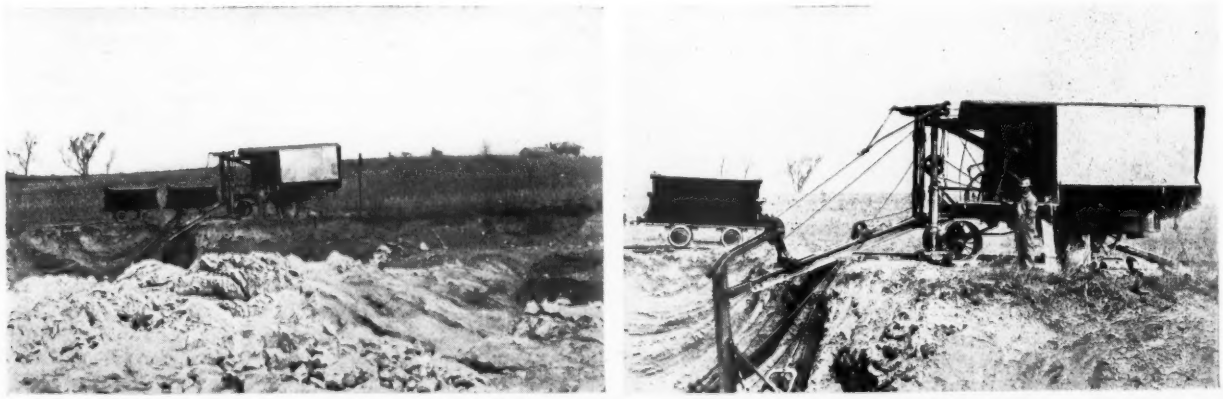
The instructions here given for preparing the socket attachment are considered the most effective known today. Proceeding in accordance with them permits of the rope being used to a full 100 per cent of its capacity, instead of only 70 per cent, the figure that has long been accepted as safe where the strands are bent back on the socket and babbitt metal used as the filler.

Stripping Rough Surfaces

FOR economical stripping where the rock surface when uncovered is rough and the overburden is not too heavy, the Palmer Lime and Cement Co. of York, Pa., uses a machine which will move on the natural ground level and reach down for the material to be excavated, as the illustrations show. A heavier machine adapted only to digging into an embankment could not be moved over the rough uncovered rock surface to reach the embankment to be excavated.

The company uses a Keystone 14-ton excavator equipped with sliding latch pull-stroke ditcher bucket. This machine is shown excavating and loading into 3-yd. Koppel industrial cars. A 32-in. scoop is used, and this gets into crevices and depressions which a clam shell would not enter. The photograph shows the rough surface of the uncovered rock which, and it shows how clean it has been stripped, all of which has been accomplished by the machine except the small pockets which were cleaned out by hand shoveling. The cut varies from 3 to 15 ft. in depth.

Two men operate the machine, which takes out about 300 cu. yd. a day. Electric power cost to operate the motor is reported to run about $3 for a 10-hour day.



For stripping where the rock surface is uneven this apparatus has been found economical

Selecting and Proportioning Sand Asphalt Paving Mixtures

By Prevost Hubbard
Chemical Engineer, The Asphalt Association

Sand constitutes from 70 to 80 per cent of the coarse mixtures needed in sheet asphalt paving. Mr. Hubbard's account of how this sand should be graded to meet the required specifications, as he told it at the 1922 convention of the American Road Builders' Association, will interest and help all sand producers

CONTROL of the character and grading of sand used in the preparation of wearing course mixtures is an important factor in the construction of sheet asphalt pavements. Ordinarily sand constitutes from 70 to 80 per cent of the weight of such mixtures and under compression during construction and the sand grains are so crowded together as to form the framework of the wearing course.

These grains take most of the wear of traffic and should therefore be of hard, sound material such as quartz, clean and free from coatings of any sort, and preferably rough surfaced, so that the asphalt cement will adhere firmly. As to the actual size and grading of the sand grains best suited for such work, much more has been learned from experience than from theory. Theory and practice do agree on the desirability of using sand with a relatively low percentage of voids when the grains are in intimate contact. Experience has shown that when certain grading requirements are met the percentage of voids may be kept within satisfactory limits without sacrificing other necessary characteristics, such as ability to carry mineral filler. Such requirements are usually included in specifications.

Sand Requirements

Sand grains passing the 200 mesh sieve are undesirable because they tend to produce a mushy mixture and limestone dust or portland cement is preferentially used to supply the very fine mineral matter necessary to fill the tiny voids. The first requirement is that the sand shall all pass the 10. mesh sieve; the second, that not more than 5 per cent shall pass the 200-mesh sieve. The first requirement can be met easily, even if the original product has some material larger than 10 mesh, by passing it over a revolving screen with openings of suitable size, which is located over the storage bins of the paving plant. If the second requirement is met, nearly all of the material passing a 200-mesh sieve will be blown out of the sand during its passage through the drier, so that, for all practical purposes, the sand specified may actually be considered as all passing the 10-mesh and retained on the 200-mesh sieve.

Having quite definite maximum and minimum limits for the sand as a whole, it is also most convenient in paving work to calculate the relative weights of the various sized grains upon a percentage basis which will show 100 per cent passing the 10-mesh and retained on the 200-mesh sieve. Eight standard sieves are used for this purpose: 10, 20, 30, 40, 50, 80 and 100 mesh, and each percentage calculated represents a size which passes one sieve but is retained upon the next smaller sieve. There are seven such individual sizes the allowable percentage limits of which are included in paving specifications. The following table shows the limits taken from Asphalt Association specifications which are typical of good practice.

SAND GRADING FOR SHEET ASPHALT

Passing Mesh	Retained on Mesh	Per cent — Individual sizes	Per cent — Group sizes
10	20	3 to 15	Coarse 14 to 50
20	30	4 to 15	
30	40	5 to 25	
40	50	5 to 30	Intermediate 30 to 60
50	80	5 to 40	
80	100	6 to 20	Fine 16 to 40
100	200	10 to 25	

Three-Group Method of Grading

In this table it is seen that, besides the limits for each individual size, the sand grains are divided into three main groups designated as coarse, intermediate and fine. The coarse group—consisting of 10, 20 and 30 mesh particles, all of which are retained on the 40-mesh sieve—is allowed to vary between 14 and 50 per cent. Taking an average of 32 per cent, an approach toward the minimum limit is desirable for heavy traffic which tends to crush the large grains more readily than the fine. For relatively light traffic a higher percentage of coarse grains is not only permissible but will produce a mixture less likely to crack by contraction owing to the thicker films of asphalt cement which it carries. Under heavy traffic any tendency to crack is largely overcome by the kneading action of the traffic itself.

The fine group—consisting of 80 and 100 mesh particles which are retained on the 200 mesh sieve—serves to fill the large voids in the combination of coarse and intermediate groups and enables the mixture to hold, evenly dispersed, the mineral filler needed to fill the very small voids and give stability to the pavement. When the percentage of the course group is relatively high the percentage of fine may be relatively low, and *vice versa*.

The intermediate group—consisting of 40 and 50 mesh particles which are retained on the 80-mesh sieve—appears to serve somewhat as a pivot for the coarse and fine groups. An average of about 45 per cent will serve equally well for use in light and heavy traffic mixes. In the former, however, the sand may carry as high as 60 per cent and the latter as low as 30 per cent of the intermediate group.

When a certain amount of each individual size is specified it is seen that the percentage limits for each size are quite broad. As a matter of fact if in each group the individual sizes are about equally proportioned, a very satisfactory grading results. The group percentages are the most important and are first considered when selecting sand for sheet asphalt construction.

The use of local sand for paving work is desirable not only from the standpoint of convenience but as a matter of economy. Sand constitutes from 70 to 80 per cent by weight of the paving mixture and a high freight rate on this constituent greatly affects the cost of the finished pavement. It frequently happens, however, that no single local sand can be found which meets specification requirements. When this happens it may be-

come necessary to mix or combine two or more available sands of known mesh composition in order to produce an acceptable product. Then it is necessary to ascertain in what proportions the sands should be used to give the desired grading. This is ordinarily done by a tryout method or by

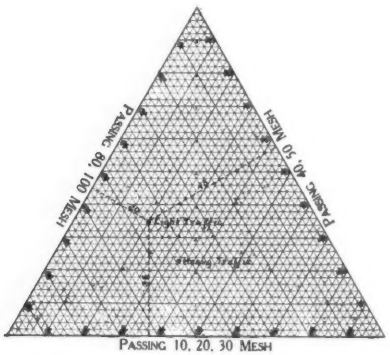


Fig. 1—Serves as a base line

a long but simple mathematical calculation. The fact that there are three main groups to be considered and that the sum of these groups equals 100 per cent, makes it possible to utilize the triaxial diagram for quickly and accurately ascertaining the most suitable proportions.

The Triaxial Diagram

For those who are not familiar with the triaxial diagram it may be said that it consists essentially of an isosceles triangle in which the perpendicular distance from each base to its opposite apex is equal.

It is a simple geometrical proposition to prove that, for any point within the area of an isosceles triangle, the sum of the perpendicular distances to each side is equal to the perpendicular distance from any side to its opposite apex. If the distance from base to apex represents 100 per cent, it is evident that the sum of the perpendicular distances from a point within the triangle to each side must also equal 100 per cent. When there are only three constituents of a substance it therefore becomes possible to plot the percentage composition of each constituent by means of a properly located point within the triangle.

In Fig. 1 each side of the large triangle serves as a base line for one of the three groups of sand grains previously discussed. The distance between each side and its opposite apex is divided into 50 equal spaces by lines parallel to the base line and the distance between each line and its neighbor therefore represents 2 per cent. Within the area of the triangle the two dots surrounded by circles represent the composition of ideal sands for light and heavy traffic which conform to the following grading insofar as the three group sizes are concerned:

Passing Mesh	Light traffic Per cent	Heavy traffic Per cent
10, 20, 30	35	23
40, 50	45	43
80, 100	20	34

The dotted lines connecting the light traffic sand with the three sides of the triangle illustrate how the position of the sand has been located to show the percentage composition aforementioned. Fig. 2 is exactly the same as Fig. 1 except that the dotted lines have been left out and a shaded area inserted to represent the precentage limitations for the three groups as covered by the specification requirements given in the first table. It is at once evident that any sand which conforms with the specification limits will fall within this shaded area if its percentage composition is plotted.

1. Triaxial Diagram in Proportioning Two Sands

Suppose two sands, *a* and *b*, are available, neither of which meet specification requirements and it is desired to ascertain if these sands may be combind so as to conform with specifications and, if so, the most suitable proportions in which

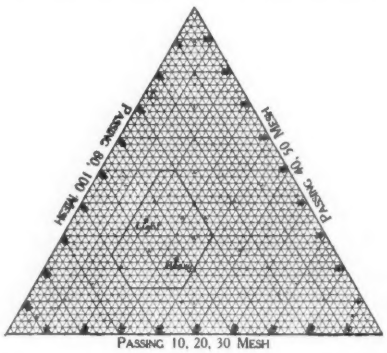


Fig. 2—Shaded area shows percentage limitations

they should be combined. Let it be assumed that these sands show the following grading:

Group Passing Mesh	Per cent A	Per cent B
10, 20, 30	60	8
40, 50	31	51
80, 100	9	41
Total	100	100

If these two sands are plotted on the diagram it will be found that their locations as shown by *a* and *b* in Fig. 3 lie outside of the specification area. The grading of all possible combinations of these two sands is then illustrated by means of a straight line drawn between these two points. If their locations had been such that the connecting line did not cut the specification area, it would have been impossible to combine them in any proportions to meet specification requirements. In the example given it is seen that the connecting line passes through the specification area and that a rather wide range of combinations will prove satisfactory. It is therefore possible to so proportion the sands as to obtain a grading at any point on the connecting line within the specification area. For example, if it is desired to produce a grading as close as possible to the ideal heavy traffic sand, the location of such grading would be indicated on the diagram at point *c*, the actual grading of this combination being as follows:

	Per cent
Passing 10, 20, 30 mesh	23
Passing 40, 50 mesh	45
Passing 80, 100 mesh	32
	100

The proportions required to produce this grading is directly indicated by the relative distances of point *c* to points *a* and *b*. Thus, if the distance from *c* to *a* is twice the distance from *c* to *b*, then two parts of sand *a* to 1 part of sand *b* will give the grading shown by point *c*. The exact proportions may be quickly ascertained by first drawing parallel lines through points *a*, *b*, and *c*. In doing this any convenient base line of the diagram may be used as a guide. In Fig. 3 the 10, 20, 30 mesh base line has been used for this purpose but either of the other base lines would have served equally as well although it is desirable to have the parallel lines as far apart as practicable. As the lines which were drawn are parallel it follows that the relative distances between them are exactly the same as the relative distances between points *a*, *b*, and *c* through which they pass. These lines may therefore be used equally well to determine exact proportions.

If we now forget the diagram itself, it will be found that four lines have been plotted (Fig. 4). By means of a special proportional parts measure, shown in Fig. 4, it becomes possible to read off at once the exact proportion in which sands *a* and *b* should be combined to produce the grading represented by *c*. The two end divisions on this measure are lettered *A*

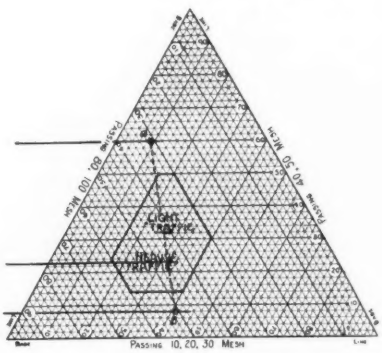


Fig. 3—Grading of all possible combinations

and *B* respectively. In using the measure, division *A* should first be placed at any suitable place on the solid line passing through point *A*, and then rotated until division *B* rests on the solid line passing through point *B*. The solid line passing

through point C intersects the measure at a division which shows the proportional parts in columns A and B to be 7 and 17 respectively—in other words, 7 parts of sand A and 17 parts of sand B will give the grading of the combination represented by point C.

2. *Triaxial Diagram in Proportioning Three Sands*

If the use of the triaxial diagram for proportioning two sands is thoroughly understood, its use in proportioning three

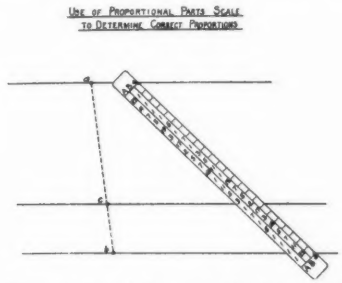


Fig. 4—Special proportioning parts measure

sands is simple. In the following example it will therefore be assumed that the reader has mastered Problem 1.

Suppose three sands, a, b, and b', are available, no two of which can be combined to meet specification requirements, and it is desired to ascertain if the three sands may be combined to conform with specifications and, if so, the most suitable proportions to use. Let it be assumed that these sands show the following grading:

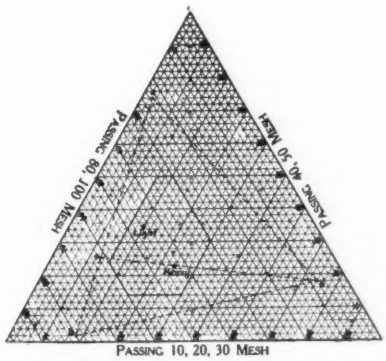


Fig. 5—Showing location of sands

Group	Per cent— a	b	b′
Passing 10, 20, 30 mesh	74	2	18
Passing 40, 50 mesh	23	80	8
Passing 80, 100	3	18	74
	100	100	100

The location of these three sands in the triaxial diagram is shown at points a, b, and b^1 in Fig. 5. None of the lines connecting these points pass through the specifications area so that no two sands can be combined to meet the specifications. By combining sands a and b, however, any grading may be obtained on line a, b and if all such possible mixtures of a and b are considered, it is seen that sand b' may be combined with mixtures to produce all gradings falling within triangle a, b, b', As the specification area falls within this triangle it is therefore possible to combine the three sands to obtain any desired grading within the specification area.

Suppose it is desired to obtain the ideal heavy traffic grading in the specification area; we may thus draw a line from point b' through the ideal heavy traffic grading and continue it until it intersects line a, b. The point of intersection may be lettered c. The determination of the proportions of sand b', which will give the ideal heavy determined (see Problem 1) and if this mixture is then considered as a single product the proportions of this mixture with sand b', which will give the ideal heavy traffic mixture, may also be determined.

Fig. 6 illustrates the preliminary steps necessary to determine these proportions with one set of parallel lines drawn through points a, b, and c and a second set of parallel lines drawn through c, b' and the ideal grading. Fig. 7 shows these parallel lines with the diagram eliminated, the lines being lettered (a), (b), (c), (a'), (b'), and (c'). Now suppose the proportional parts measure shows that one part of a and two parts of b will produce c. Further suppose it is found by using the measure that two parts of this mixture now called sand a' and one part of sand b' will give the ideal grading now called c'. The direct proportions of sands a, b, and b' would be obtained by multiplying the parts of a and b by the parts of a' and multiplying the parts of b' by the sum of the parts of a and b, as follows:

	Parts				Direct Proportions	
a	1			a	1×2	2
b	2	a'	2	b	2×2	4
Total	3	b	1	b'	3×1	3
				Total		9

For use with the triaxial diagram a proportional parts measure may be devised with any convenient scale of divisions. For most purposes the a scale, showing all common proportions not exceeding a total of 12 parts to the mixture, will be satisfactory. For the sake of convenience when actually mixing sands it is desirable to use as few total parts as possible, it will often be found that without creating much change in the grading of a mixture one set of proportions may be as good as another. In such cases the simplest proportions should be selected. Thus, in Fig. 4, while the exact proportions of sands a and b are shown as 7 to 17 respectively, it is seen that the more simple proportions of 1 to 2 or 1 to 3 are quite close. Reference to Fig. 3 will further show that either of these simple proportions is sufficiently close to the desired grading to be adopted as a matter of convenience.

The triaxial diagram takes into account the three sand groups only and that the intermediate gradings are also covered in specifications. After it has been used, therefore the individual gradings should be calculated on the basis of the proportions which have been indicated in order to ascertain if such proportions will be entirely satisfactory. If not, a slight change in indicated proportions will often be found to bring the mixture within specification limits in all respects. If any individual size is missing in all of the sands the specifications cannot be met, but this would be a rare exception and in most cases

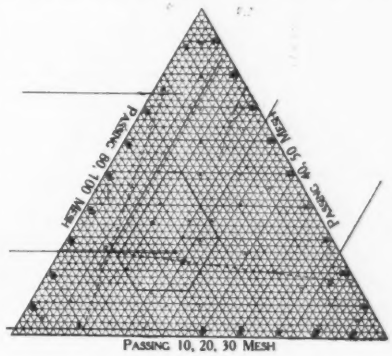


Fig. 6—Preliminary steps

the proportions determined from the group gradings alone will be found satisfactory.

The Triaxial Diagram in Field and Plant Use

A triaxial diagram with a transparent cover of celluloid or tracing cloth, carried in the coat pocket, will often prove a considerable time and labor-saving device for the contractor, inspector and engineer, both when prospecting for available sands and in setting proportions for use at the paving plant. The transparent cover may be used for plotting the sand gradings and drawing the lines for use with the proportional parts

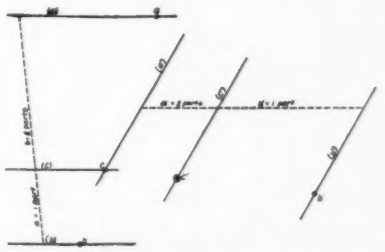


Fig. 7—Proportional parts measure

measure, and when one set of determinations has been made all marks may be erased and the cover used over and over.

If when prospecting for sands a portable field outfit consisting of a small spring balance and set of our sieves (10, 40, 80, and 200 mesh) is used, the triaxial diagram will quickly show when suitable products have been located. Those who have not been familiar with the triaxial diagram these methods may at first seem somewhat complicated, but with a little practice it will soon be found that its use is a very simple matter and much less tedious and complicated than any method of mathematical computation.

Lower Freight Rates

A 10 per cent cut, effective July 1, will aid producers and help business generally

A GENERAL reduction of freight rates amounting to 10 per cent of existing rates, announced on May 24 in the decision of the Interstate Commerce Commission to become effective July 1, will bring a measure of relief and increased business to most of the rock products industries. In cases where special reductions since August 26, 1920, have been made, the present cut will not give a further reduction except where the previous cuts were for the purpose of equalizing rates. Producers in several states already enjoy intrastate rates on some commodities lower than the interstate rates resulting from the present reduction.

The decision of the Commission reviews the case at length before announcing the findings. Brief extracts of the review of special interest to rock products producers, together with the decision in full, is taken from the *Traffic World* as follows:

It is estimated that the cut will mean to the shipping public, in dollars and cents, in the neighborhood of $225,000,000. In their constructive year, based on 1921 tonnage, the carriers estimated the estimate above of $225,000,000, will bring the total reductions since August 26, 1920, to $411,700,000. The commission said in the opinion that rates of pay for employes have been reduced to an extent which, based upon the light traffic of 1921, was estimated by the carriers to aggregate more than $350,000,000 per annum, and that the Railroad Labor Board has estimated that the reduction exceeds $400,000,000 per annum without taking into account changes in rules and working conditions.

No order was issued by the Commission It said that the carriers should advise it promptly and not later than May 31, if possible, whether the findings would be carried into effect without formal order or orders.

Freight Rates and Charges

Under the heading "Freight Rates and Charges" the Commission said:

"In Increased Rates, 1920, supra, we permitted percentage increases in the charges for freight service, including switching and special services, as follows: In the eastern group, 40 per cent; in the western group, 35 per cent; in the southern and mountain-Pacific groups, 25 per cent; and upon interterritorial traffic 33⅓ per cent. In Authority to Increase Rates, supra, the 40 per cent increase was authorized within Illinois territory as there defined and between that territory and the eastern group, and a 35 per cent increase between that territory and the western group. The average revenue per ton-mile in 1921, was greater than that for the fiscal year ended June 30, 1914, by the following percentages: Eastern district, 96.1; southern district, 61.4; western district, 59.3; and United States as a whole, 76.2. In 1914 the average-distance haul per revenue ton was 155 miles and in 1921, 187 miles.

THE decision of the Interstate Commerce Commission gives in effect a 10 per cent reduction from existing rates. The rate changes are expressed as increases over the rates prior to August, 1920, and for the various groups are expressed as follows:

"In the Eastern group, also between points in Illinois territory and between Illinois territory and the Eastern group, 26 per cent instead of the 40 per cent authorized in the decisions last cited.

"In the Western group, and between the Western group and Illinois territory, 21.5 per cent instead of 35 per cent so authorized.

"In the Southern and mountain-Pacific groups, 12.5 per cent instead of the 25 per cent so authorized.

"On the Interterritorial traffic, except as otherwise provided herein, 20 per cent instead of the 33⅓ per cent so authorized."

"Many rate readjustments, resulting in reductions, have been made since the increases of 1920. Some affected a substantial volume of traffic such as export grain, bituminous coal to Lake Erie ports for the Northwest, sand and gravel in eastern territory, ore, lumber and petroleum and its products. In some instances the volume of traffic after the reduction was less and in others more than before the reductions. Protests, usually alleging undue prejudice, have been filed by shippers against many of these readjustments, and in some cases have resulted in suspension proceedings. Some readjustments have been made hastily under pressure from particular shippers, or for the purpose of retaining traffic or deflecting it from one group of carriers to another.

Evidence on Special Commodities

"Evidence was introduced concerning a wide range of commodities. Particular attention was directed to basic commodities, among which may be mentioned coal, iron, and steel and the materials which enter into their manufacture, stone, sand and gravel, brick and clay products, cement, forest products, foodstuffs, agricultural products, and live stock.

"Shippers of basic commodities submitted the same general character of evidence relative to the necessity of rate reductions as other shippers, but advocated large reductions upon the basic commodities even though as a result no reductions may now be made upon other commodities. They urged that generally these commodities constitute low-grade freight which moves in any class of equipment, loads heavily, is subject to little loss or damage in transit, and consequently is desirable traffic for the carriers and entitled to the lowest rates.

"They also urged that, since the existing rates were authorized, price declines on basic commodities had been more severe than on higher-grade commodities; that their industries as a whole were in a depressed condition; that in some cases the commodities were being sold at a loss; that many basic commodities are important raw materials used in manufacture; that rate reductions thereon will do much to reduce cost of production and to stimulate business; and that generally transportation charges thereon were and are out of proportion to the value of the property transported, and restrict production and movement.

"Particular stress was laid upon the rates on commodities used in the construction of buildings, bridges, and roads. Shippers of road materials pointed to the need of many miles of improved highways and urged that road construction should be undertaken on a large scale during times of depression and unemployment. Building construction needs for the present year are greater than those incident to years in the period

immediately preceding the war. Not only has the population of the country increased, but during the war building and other construction, except for war purposes, was largely suspended and the shortage then created has not yet been supplied. This is particularly true of dwellings, the shortage in which is reflected in the high rents prevalent for living apartments and dwelling houses. The President's conference on unemployment in its report of September 29, 1921, said: 'We are short more than a million homes; all kinds of building and construction are far behind national necessity.' A representative of building-material manufacturers and building contractors presented evidence to the effect that lowered building costs must be brought about if the housing shortage is to be overcome; and that prices of material and labor in the construction industry have fallen much below the peak, whereas freight charges on building materials generally have not been reduced. Figures presented by him indicate that, using 1913 as 100, the index of building-material prices reached 310 during 1920 and had receded in December, 1921, to 163.2; and that, although no general statistics on building labor are available, the December labor index, again using the year 1913 as 100, was probably not far from that on building material, 163.2, which represents reduction from a peak of somewhere between 300 and 400 in 1920. The figure 163.2 has not been reconciled with that of 203 published by the United States Bureau of Labor Statistics. The efficiency of labor appears to have greatly increased since war years. Shippers of building materials further urged that the increases in freight charges as made affected heavy low-priced construction materials far more than commodities of higher value, upon which the percentage of freight charge to value was comparatively small; that the heavier construction materials, considered as a group, are important money-earning freight for the railroads, and that revival in the construction industry will do much to build up the earnings of the carriers. These shippers, as men experienced in business, expressed their conviction that sound public policy demands a reduction of rates of transportation on basic commodities which will tend to encourage production, create employment, and reduce the general level of the cost of living. They emphasized the contention that the public welfare requires that these indispensable commodities be moved as cheaply as possible.

"The following table reflects the wholesale index prices, all commodities, compared with the ton-mile revenue for Class I roads by years for 1916, 1917, 1918, 1919, 1920, and 1921. Relative figures for 1913 are taken as 100, the calendar year being used for prices and the year ended June 30, 1913, for revenue:

Period Year ended Dec. 31—	Wholesale prices	Average revenue per ton-mile
1916	124	98
1917	176	99
1918	196	118
1919	212	135
1920	243	146
1921	153	177

Rates Are Too High

"Shippers almost unanimously contend, and many representatives of the carriers agree, that 'freight rates are too high and must come down.' This indicates that transportation charges have mounted to a point where they are impeding the free flow of commerce and thus tending to defeat the purpose for which they were established, that of producing revenues which would enable the carriers 'to provide the people of the United States with adequate transportation.'

"Practically all agree that stability of freight rates is highly desirable and that normal traffic may not well be expected until the present widespread expectation of rate reductions is realized or dispelled. To assume that rates can or should be stabilized on the present high basis is futile. As already observed, the anticipation of a falling market tends to restrict purchases, and until the public is convinced that there is little likelihood of immediate further material reductions in prices or transportation charges, the confidence necessary to normal business will to that extent be impaired. The period of deflation has been in progress more than 15 months; demand is reviving; prices are showing a tendency to stabilize upon a level much below that of 1920 but above that of pre-war years; and conditions of the agricultural and manufacturing industries have greatly improved in the past few months.

"We are of opinion that general reduction in the rate level, as substantial as the condition of the carriers will permit, will tend not only to lessen the transportation burden but also to equalize and stabilize the conditions under which commerce and industry are carried on, with consequent fuller assurance to the carriers of realizing the fair return contemplated by the law.

What the Findings Are

"After considering all the facts of record, including the necessity of reasonable expenditures for additions and betterments, we find and determine:

"1. That on and after March 1, 1922, a fair return upon the aggregate value of the railway property of the carriers defined in section 15a of the interstate commerce act, determined as therein provided, will be 5.75 per cent of such aggregate property value as a uniform percentage for all rate groups or territories designated by this commission.

"2. That the existing freight rates and charges, including charges for switching and other accessorial services and all other charges applicable to freight service which were increased by authority of Increased Rates, 1920, supra, will be on and after July 1, 1922, unjust and unreasonable to the extent that they may respectively include more than the following percentages of increase over the rates in effect immediately prior to August 26, 1920, in and between the various rate groups as defined in Increased Rate, 1920, 58 I. C. C. 220, 489, and Authority to Increase Rates, ibid., 302:

"In the eastern group, also between points in Illinois territory and between Illinois territory and the eastern group, 26 per cent instead of the 40 per cent authorized in the decisions last cited.

"In the western group, and between the western group and Illinois territory, 21.5 per cent instead of 35 per cent so authorized.

"In the southern and mountain-Pacific groups, 12.5 per cent instead of the 25 per cent so authorized.

"On interterritorial traffic, except as otherwise provided herein, 20 per cent instead of the 33 1/3 per cent so authorized.

"3. That the freight rates and charges herein determined will enable the carriers in the respective rate groups, under honest, efficient, and economical management and reasonable expenditures for maintenance of way, structures and equipment, to earn an aggregate annual net railway operating income equal, as nearly as may be, to a return of 5.75 per cent upon the aggregate value, as taken for the purposes of this proceeding, of the railway property of such carriers held for and used in the service of transportation.

"4. That in applying the reductions above prescribed, rates between points within a group and points on the border line of that group shall be reduced as provided for the group. Where a river constitutes a boundary line between two groups, points on both banks thereof shall be considered as border-line points. Where rates are constructed by the use of combinations upon gateways between any two groups, each of the factors comprising such through rates shall be reduced separately according to the group in which it accrues.

"5. Under the circumstances described in paragraphs (a), (b) and (c) below, carriers should consider existing freight rates and charges as representing those made effective by authority of Increased Rates, 1920, supra, and shall apply the reductions herein prescribed accordingly, even though in such instances some individual rates or charges may be higher and others lower than those which would result from exact application of the bases above prescribed:

(a) Where, since August 26, 1920, rates or charges have been readjusted primarily to remove discriminations, prejudices or discrepancies without material effect upon the aggregate level of the rates or charges so adjusted. This does not apply to rates or charges which have been reduced since August 26, 1920, primarily for the purpose of removing all or a part of the general increase of 1920.

(b) Where previously existing recognized rate relationships were maintained in applying the increases of August, 1920, or where rates have been readjusted since August 26, 1920, to restore previously existing recognized rate relationships. In these cases, such recognized rate relationships should be maintained in applying the reductions herein prescribed; or, if that is impracticable in the first instance, the rates should be readjusted to restore such relationships as soon as practicable.

(c) Where, pursuant to decisions by us, rates or charges shall have been changed since August 26, 1920. This does not apply to rates resulting from Rates on Grain, Grain Products, and Hay, 64 I. C. C., 85; National Livestock Shippers' League vs. A. T. & S. F. Ry. Co., 63 I. C. C., 107; Southern Hardwood Traffic Asso. vs. I. C. R. R. Co., 66 I. C. C., 68.

"6. Where outstanding decisions by us require changes in rates or charges subsequent to June 30, 1922, the rates or charges existing on June 30, 1922, shall be reduced as herein provided, effective July 1, 1922. In proceeding thereafter to comply with such outstanding decisions, the rate or charges which would result therefrom shall be considered as those effective by authority of Increased Rates, 1920, supra, and the reductions herein prescribed shall be applied thereto, except that this provision shall not apply to rates on brick and related articles as prescribed for application between points in the eastern group in National Paving Brick Mfrs. Assn. vs. A. & V. Ry. Co., 68 I. C. C. 213. Those rates are not required to be further reduced hereunder.

"7. Where rates on live stock have been reduced pursuant to our recommendations in National Live Stock Shippers' League vs. A. T. & S. F. Ry. Co., supra, and are now less than the rates herein prescribed, the expiration date thereon should be canceled and the rates maintained in effect.

"8. In computing and applying all reduced rates and charges prescribed herein, fractions will be treated as follows:

(a) Where rates or charges are stated in amounts per 100 pounds or any other unit except as provided in the succeeding paragraphs, fractions of less than ¼ of a cent will be omitted. Fractions of ¼ of a cent or greater but less than ¾ of a cent will be stated as ½ cent. Fractions of ¾ of a cent or greater will be increased to the next whole cent.

(b) Where rates or charges are stated in amounts per ton, or in cents or dollars and cents per carload, including articles moving on their own wheels, when not stated in amounts per 100 pounds or per ton (except as provided in (c)), fractions of less than ½ cent will be omitted. Fractions of ½ cent or greater will be increased to the next whole cent.

(c) Where rates or charges are stated in dollars or dollars and cents per carload, including articles moving on their own wheels, when not stated in amounts per 100 pounds or per ton, amounts of less than 25 cents will be dropped; thus $25.24 will be stated as $25.00. Amounts of 25 cents or more but less than 75 cents will be stated as 50 cents; thus $25.65 will be stated as $25.50. Amounts of 75 cents or more but less than one dollar will be raised to the next dollar; thus $25.80 will be stated as $26.00. This rule will apply only in cases where the present rate is $10.00 or more.

(d) Where carriers elect to comply with the findings herein by making percentage reductions in existing rates or charges, the rules prescribed in (a), (b) and (c) shall apply.

"9. Where carriers earn specific amounts as their divisions or compensation out of joint rates or charges, such amounts shall be reduced in the same manner as provided for the through rates or charges. Where the divisions of carriers participating in joint rates or charges are in fixed amounts per unit and are absorbed by other carriers, such absorptions shall be reduced in the same manner as the through rate or charge.

"10. In instances where application of the bases herein prescribed results in departures from the provisions of the fourth section of the act, the carriers will be expected to correct such departures by tariffs filed not later than October 1, 1922. Temporary fourth section relief will be granted by appropriate order. If necessary, interested parties may bring to our attention any of our outstanding orders which may require modification to permit prompt and full compliance with the findings herein.

"11. It is important that the reduced rates and charges be made effective at as early a date as practicable. Those herein prescribed shall be made effective on or before July 1, 1922, upon not less than 10 days' notice to the commission and to the general public by filing and posting in the manner prescribed in the interstate commerce act.

"12. The findings in paragraphs 2 to 11, inclusive, apply to all respondents other than electric lines not operated as a part of a steam railroad system. They do not apply to milk and cream when the revenue from transportation thereof is not included in freight revenue. Nothing herein shall be construed as applying to the proportions of joint through rates or charges to or from points in foreign countries accruing in such foreign countries, or as authority to increase any existing rates or charges.

"The respondents should advise us promptly, and not later than May 31, 1922, if possible, whether the findings herein will be carried into effect without formal order or orders by us."

A Discussion of Commodities

The Commission discussed the rate situation with regard to coal and coke, iron, steel and ore, road and building materials, forest products, agricultural products and live stock, packing-house products, fertilizer and fertilizer materials, waste materials, petroleum and products, roofing slate, groceries, milk, cream and dairy products, paper and paper products, cotton-seed products, vegetable oil and soap, and miscellaneous commodities.

As to coal, the Commission said shippers who opposed a horizontal reduction and favored reductions on basic commodities with few exceptions selected coal as one of the commodities on which reductions should be applied if any reductions were made. It discussed the importance of the coal traffic with its relation to industry. Generally speaking, the Commission said, transportation charges on coal have not increased since 1915 in any greater ratio than mine prices, nor does it appear that on the average the ratio of transportation charges to mine prices was greater in February, 1922, than in the period 1904-1915. It said that in 1921 carriers used approximately 130 million tons of coal, and that many carriers pay transportation charges on coal to other carriers. It said coal operators urged that the reduction in these charges would to a considerable extent offset any loss in revenue resulting from rate reductions on coal.

"A witness for the carriers testified that a 10 per cent reduction in coal rates in the eastern group, based upon 1921 tonnage, would result in loss in revenue approximately $72,740,000, whereas the reduction in transportation charges paid by eastern carriers would be less than $4,700,000," the Commission said. "It is evident, therefore, that loss in revenue from coal-rate reductions would affect some carriers greatly and others but little. Some of the less prosperous carriers are among those carrying a high proportion of coal."

The Commission said complaint had been made of the existing relationship of the rates on coke to those on coal but that the record afforded insufficient basis for conclusions as to what, if any, readjustments should be made. As to anthracite, the Commission said the present rates represented a smaller percentage of the mine price than prior to 1915.

On iron, steel and ore, the Commission reviewed conditions in the iron and steel industry, saying it felt warranted in taking notice of the fact that since the case was submitted the general condition of the iron and steel industry had materially improved. It said the principal raw materials used were coal, coke, dolomite, limestone, and iron ore, and that except in particular situations, or to the extent that rates on one or more raw materials were from a transportation standpoint too high as compared with rates on others, it would appear that reductions in rates on the raw materials should, in so far as possible, be made upon all alike. The mining and smelting industries, the Commission said, attributed depression in large measure to the rate increases of 1920. It said there had been some improvement in these industries since the autumn of 1921 but that until overstocked markets shall have further readjusted themselves, the volume of movement could hardly be materially increased by establishment of any ore and smelter-product rates which would be fairly compensatory to the carriers. It called attention to the fact that rates on low-grade ores in many of the

intermountain states were not increased in 1920.

As to road and building materials, the Commission reviewed the testimony applicable to those commodities. Aside from saying that many reductions in rates have already been made, principally in the eastern group, on clay, sand, gravel and crushed stone, and that it would not pass on the contention of shippers of asphalt that rates thereon should not exceed cement rates, the Commission expressed no conclusions.

The Commission said the carriers should promptly revise their rates on roofing slate to central territory so as to bring them into better accord with rates on other roofing materials.

What the Rate Cut Will Do

Opinions From a Dozen Producers

REPRESENTATIVE producers and association officials in the rock products industries are quite unanimous in their opinions that the general freight rate reductions of 10 per cent become effective July 1, will have a stimulating effect on their business. Even without the reductions, building materials have been moving in large volume—cement manufacturers have large quantities of unfilled orders, lime and gypsum have been in demand for construction work, and production figures for sand, gravel and crushed stone are running high in many sections of the country.

Still better business is anticipated as a result of the rate cut, especially after July 1. During the month of June purchasers are likely to buy only on a hand to mouth basis, and producers are counting on a comparatively quiet month followed by a rush as soon as the lower rates become effective July 1.

In the cement industry, according to B. F. Affleck, president of the Universal Portland Cement Co., the freight cost from mill to destination will be reduced from 4 to 5 cents a barrel, and the manufacturing cost will be lowered 1 to 2 cents a barrel, both as a direct result of lower freight rates. Because of an impending scarcity and the present high price of coal, and the difficulty in securing labor, cement prices in the east were raised 20 cents a barrel two or three weeks ago, and a similar situation in the middle west has caused a raise of price of 10 cents a barrel, announced this past week. The likelihood is that 4 or 5 cents will come off the present price as soon as the lower freight rates become effective.

Cement manufacturers have on their books a larger volume of unfilled orders than ever before.

Gypsum, which so far has had a fairly good year, is showing still more improvement, especially in the East and Northwest, according to W. D. Lindsay of the U. S. Gypsum Co. A slight slowing down of shipments during June is expected, though material needed for immediate use is not likely to be delayed in shipment. After July 1 the lower rates are expected to bring still more business than would have been available without lower rates.

The moral effect of the removal of uncertainty as to freight rates is given as the principal benefit of the reduction by L. T. Sunderland, president of the Portland Cement Association, who asks for still further reduction on all basic commodities. A telegram from Mr. Sunderland to ROCK PRODUCTS explains his position:

"The general freight rate reduction when effective will remove some of the uncertainty which has retarded shipments and doubtless will stimulate to a small degree the use and movement of cement. However, the complete rmoval from all basic commodities of the percentage increases imposed by I. C. C. Ex Parte 74 will be necessary to restore long existing relationships whose disturbance is one of the major causes of the serious business dislocation and paralysis from which the commerce of the entire country is suffering."

Sand, gravel, and crushed stone producers are not uniformly benefited by the reduction. In many cases reductions from the increases authorized in Ex Parte 74 are already effective, so that the general 10 per cent reduction will give no further benefit to shippers. There is still before the I. C. C. the particular case of the sand and gravel producers. The final step in this case was the argument before the Commission on May 22 at which no testimony was taken. The decision on this case is expected at any time now, and producers are hoping for a special reduction. Alex W. Dann, president of the National Association of Sand and Gravel Producers, who has directed the producers' side of this special case, says in a telegram following the announcement of the general rate reduction: "I do not believe that recent reduction made by I. C. C. is anywhere nearly sufficient on sand and gravel." E. Guy Sutton, until recently secretary of the National Association of Sand and Gravel Producers, and now in the business of producing sand and gravel, says:

"In my opinion, the general reduction of 10 per cent authorized by the Interstate Commerce Commission in its recent decision, taken in conjunction with some of the voluntary decreases already made by the railroads, will be a great help in stimulating the movement of sand and gravel.

"However, there is imperative need for further reductions and adjustments, for in many instances the freight charges on sand and gravel will still be beyond the amount which the traffic will bear."

From W. Scott Eames, general manager of the New Haven Trap Rock Co., and president of the National Crushed Stone Association, comes the following telegram:

"The reduction in freight rates will help stabilize and have a moral effect in increasing business and the stone producers will have a marked improvement in business all over the country. Our shipments by rail have increased 30 per cent over last year for the month of May and we feel that this reduction will greatly increase our business."

Another large producer of crushed stone, John Rice, president of the General Crushed Stone Co., is already receiving favorable rates, especially in New York state. A telegram from him says:

"There has been no suggestion that the late freight reduction will affect existing rates. Railroads on which we are shippers have shown a very cooperative spirit in the line of reductions and adjusting rates to conditions."

A similar feeling of present security is echoed in telegrams from E. M. Lamkin, president of the National Agstone Association, and A. P. Sandles, secretary of the same association. Mr. Lamkin, referring to the Ohio rates which are already favorable, says:

"Suggested freight rate reduction to take effect July first in C. F. A. district if approved no doubt will stimulate interstate shipments considerably, as many are waiting decision before placing orders. Have already benefited by reduction of about 28 per cent on intrastate shipment which is causing too short a haul. Interstate reduction will improve this condition. State rates already reduced will not be benefited by reduction."

From Mr. Sandles comes this telegram, indicating a desire not to be disturbed in an already advantageous position:

"Recent 10 per cent freight rate reduction may be a Greek bearing gifts. If this Interstate Commerce Commission order means a cut of 10 per cent from the maximum rate level established by all the previous rate increases and wipes out all the intrastate rate reduction and personal adjustment made by shippers with carriers, then the railroads can well

laugh up their sleeve. If this order does not disturb our present rates and shipping agreements, we need not worry."

In the lime industry, the opinion seems to be that the improved general business situation resulting from the rate cut, rather than the direct effect of the cut, will be the important result to lime manufacturers. Charles Warner, president of the Charles Warner Lime Co. and of the National Lime Association, sends the following telegram:

"We do not believe the general freight reductions will have an immediate direct effect on further improving production and shipments of lime, but the general effect of these freight reductions in stimulating other lines of business should shortly act to substantially improve the lime situation as it will aid business in general."

Bernard L. McNulty, general manager of the Lehigh Lime Co., voices a similar opinion:

"The proposed 10 per cent reduction in freight is one more contributing factor to improve business conditions. It is doubtful if it will cause a great increase in tonnage in the lime industry, though it will help to stabilize the market and create greater confidence in trade circles generally."

Slate producers should benefit from the Commission's instructions to carriers to revise promptly rates on roofing slate to central territory. Here is the opinion of William H. Smith, secretary-treasurer of the North Bangor Slate Co., who prepared the testimony at the special slate hearings before the I. C. C.:

"Natural effect of freight rate reductions should be to slow up shipments till after July. No evidence of this as yet though after July we anticipate greatly increased shipments to replenish present low stocks. No marked increase in production quickly possible but anticipate gradual healthy growth."

Supplementing this telegram by letter, Mr. Smith says: "The incoming business appears to be on a gradually increasing scale, especially as regards roofing slate and slate blackboards. Milled slate will likely be affected to a somewhat greater degree by the deferring of shipments than is the case with either of the other lines.

"With respect to the effect of this reduction generally, we believe it will tend to largely stimulate our business. There has been a tendency to hold back the placing of orders so far as it was possible to hold them back for some months past. In other words the orders that have been coming in have been mostly for immediate consumption. In normal times, however, there is a considerable quantity of slate stocked by buyers to meet requirements as they arise. Very little of this stocking has been done this year, with the result that customers' yards are practically bare. Now that the freight rate is settled, there is little incentive for cutsomers to hold back the replenishment of their stocks. We therefore look for a considerable increase in business after July 1.

"The reason that no large increase in production of slate is possible now is that in order to largely increase production the working forces must be largely increased. The necessary skilled men are not available and others must be obtained and trained.

"Inasmuch as roofing slate has been shipped on the basis of 6th class, and other roofing material on the basis of 90 per cent of 6th class, it will be seen that roofing slate will receive a somewhat larger reduction in rates than is applicable to materials generally."

Hoover Fixes Coal Prices

FAIR maximum prices for bituminous coal at the mine for three districts were announced by Secretary of Commerce Hoover May 31 after a day of conferences with operators.

The prices ranged from $2.20 to $2.60 a ton for the Alabama district, $3.50 a ton for the smokeless coal districts of West Virginia, and $3.50 a ton for the Harlan and Hazard fields of Kentucky and the southern Appalachian fields of Tennessee and Kentucky.

The maximum for the Alabama district is 25 cents a ton below the final Garfield war time scale, while the maximums proposed for the other districts are somewhat above the Garfield prices. The prices are to apply only to spot coal.

Secretary Hoover at a conference early in the day, attended by more than 500 producers whose mines are in operation in the non-union fields, announced that he would assume personal responsibility for fixing maximum prices as a means of preventing profiteering. Because of possible infringement on anti-trust laws, Mr. Hoover said that he would ask the operators to agree among themselves on fair prices, but that he would take all responsibility upon himself. His only weapon in enforcing them is the power of public opinion.

At the request of Mr. Hoover committees were named by the operators of the various districts to advise him as to conditions which might warrant modifications from the wartime scale of prices fixed by former Fuel Administrator Harry A. Garfield. Mr. Hoover said that while the Garfield prices would form the basis of his new fair prices, he would endeavor to modify them to meet changes in conditions.

Announcement of what he considers fair prices was made by Secretary Hoover in separate statements dealing with the three districts.

The statement relative to prices in the smokeless coal districts of West Virginia follows:

"After having consulted the operators in the Pocahontas, New River, Tug River and Winding Gulf fields (smokeless coal districts of West Virginia) and having been assured of the co-operation of 80 per cent of the production here represented and having the approval of the director of the Geological Survey and the acting director of the Bureau of Mines, I have concluded that $3.50 a ton is a fair maximum price for spot run of mine coal for these fields, the operators absorbing in these prices a reasonable selling expense. The prices for prepared and slack coal are to bear a differential up and down equal to the Garfield scales."

Secretary Hoover summarized his plan as follows:

1. That the Garfield prices for run of mine coal should be the basis of computing sales prices with such adjustments as are necessary to include wholesale selling costs, changed conditions at the mines, and other factors that will be fair to the public and the operators maintaining production.

2. That each district should nominate to the Secretary of Commerce a committee to advise with him on conditions which bear on the Garfield level and on which a basis of fair prices in each district may be established by the Secretary of Commerce.

3. That after the fair prices have been established these district committees should report to the Secretary of Commerce any cases of profiteering and act as he requests to meet such cases.

Following the general conference the different groups of operators met independently to select committees to discuss the situation in the various districts with Secretary Hoover.

Appointment of an advisory committee was announced by Mr. Hoover. This committee is composed of Alfred M. Ogle of Terre Haute, Ind., new president of the National Coal Association; C. E. Bockus of New York City, a coal operator; George Otis Smith, director of the Geological Survey; E. A. Holbrook, acting director of the Bureau of Mines, and

F. R. Wadleigh of the fuel division of the Bureau of Foreign and Domestic Commerce.

Secretary Hoover in addressing the conference said that action is necessary to prevent high prices.

"We are producing 5,000,000 tons of bituminous coal a week," said Mr. Hoover. "Our consumption is from 8,000,000 to 8,500,000 tons a week. We are drawing from stocks at the rate of probably 3,500,000 tons a week."

Wholesale coal quotations in Chicago, f.o.b. mines, for the day of the announcement and the day following were given as follows in the *Chicago Journal of Commerce:*

"The time is coming when those unwise virgins who did not take my repeated recommendations to stock themselves with coal will be forced to go into the open market. In the last disturbance prices went from $6 to $10 to even as high as $15 a ton at the mine. It is my distinct recollection of that period that the operators considered it the most disastrous thing which had happened to them. We have felt that before such an occasion arose again it was desirable to take steps to prevent its occurrence.

Industry Suffering Loss

"The preliminary conference held recently with thirty or forty operators has resulted in putting a check on the daily rise of prices. Prices range from $2.25 to $2.50 a ton in most districts, though in some districts they are above the $4 mark. The unrestrained operation of the law of supply and demand can easily carry the price to $10 or $12 at the mine, and I believe you will agree with me that must be prevented. I am aware that the industry during the last twelve months has been operating without a profit and possibly at a loss.

"The public should understand that there is not a shred of law or authority to determine or enforce a fair price and that there is no law to prevent profiteering.

"The law prevents the operators from agreeing to a fair price among themselves. A combination in the public interest is just as illegal as one not in the public interest. I am going to take the responsibility upon myself as to what is fair. I am going to ask the operators to do what is fair. The agreement will be only between the operator and myself."

WHOLESALE—F. O. B. MINES JUNE 1

Bituminous	
Southern Illinois	
Prepared sizes	$3.65@4.00
Mine run	3.50@3.65
Screenings	3.00@3.25
Belleville Standard District	
Lump	$3.00@3.25
Mine run	2.50@3.00
Screenings	2.50@3.00
Central Illinois	
Prepared sizes	$2.65@3.00
Mine run	2.75@3.00
Screenings	1.85@2.25
Northern Illinois	
Prepared sizes	$4.25@4.50
Screenings	2.25@3.50
Indiana Fourth Vein	
Prepared sizes	$3.00@3.25
Mine run	2.50@2.75
Screenings	2.10@2.50
Indiana Fifth Vein	
Prepared sizes	$2.50@2.75
Mine run	2.50@3.00
Screenings	2.35@2.60
Western Kentucky	
Prepared sizes	$3.00@3.25
Mine run	3.00@3.25
Screenings	3.00@3.25
Eastern Kentucky	
Prepared sizes	$2.75@3.00
Mine run	2.75@3.00
Screenings	2.75@3.00
W. Va. High Volatile	
Lump	$2.75@3.00
Mine run	2.75@3.00
Screenings	2.75@3.00
Pocahontas—New River, Va.	
Prepared sizes	$2.75@3.00
Mine run	2.75@3.00
Screenings	2.75@3.00
Ohio Hocking	
Lump	$3.00@3.10
Mine run	2.75@3.00
Screenings	2.00@2.25
Coke	
Chicago By-product	$ 10.00
Connellsville foundry	6.50@7.00
Connellsville furnace	6.00@6.50
Wise County foundry	6.00@6.50
Wise County furnace	5.00@5.50

Anthracite	Old Line Per Ton	Independent 2,000 Lb.
Egg	$6.95@7.40	$7.50
Stove and Nut	7.20@7.60	7.75
Pea	5.60@6.10	6.10
Buckwheat	3.00@3.50	3.50

WHOLESALE—F.O.B. MINES JUNE 2

Bituminous	
Southern Illinois	
Prepared sizes	$4.00@4.25
Mine run	3.50@4.00
Screenings	3.50@4.00
Belleville Standard District	
Lump	$4.00@4.25
Mine run	3.50@4.00
Screenings	3.50@4.00
Central Illinois	
Quotations withdrawn because of strike.	
Northern Illinois	
Quotations withdrawn because of strike.	
Indiana Fourth Vein	
Quotations withdrawn because of strike.	
Indiana Fifth Vein	
Quotations withdrawn because of strike.	
Western Kentucky	
Prepared sizes	$3.00@3.25
Mine run	3.00@3.25
Screenings	3.00@3.25
Eastern Kentucky	
Prepared sizes	$3.00@3.25
Mine run	2.75@3.00
Screenings	2.75@3.00
W. Va. High Volatile	
Lump	$3.00@3.25
Mine run	2.75@3.00
Screenings	2.75@3.00
Pocahontas—New River, Va.	
Prepared sizes	$3.25@3.50
Mine run	2.75@3.00
Screenings	2.75@3.00
Ohio Hocking	
Quotations withdrawn because of strike.	
Coke	
Chicago By-product	$ 10.75
Connellsville foundry	6.50@ 7.00
Connellsville furnace	6.00@ 6.50
Wise County foundry	6.00@ 6.50
Wise County furnace	5.00@ 5.50

Anthracite	Old Line Per Ton	Independent 2,000 Lb.
Egg	$6.95@7.40	$7.50
Stove and Nut	7.20@7.60	7.75
Pea	5.60@6.10	6.10
Buckwheat	3.00@3.50	3.50

O. C. Hubbard Resigns

IT will be a matter of surprise as well as regret to his many friends and associates in the industry to learn that O. C. Hubbard, present executive secretary of the Wisconsin Mineral Aggregate Association, has asked that his resignation be received. Mr. Hubbard asks that he be released from his duties not later than July 1.

"Considering the heavy co-operation given me by the members, with the backing and assistance of the officers and executive board," said Mr. Hubbard, "it is no easy task for me to surprise you with this letter of resignation. I have never been denied anything in the way of assistance toward furthering the interests of the industry, and it is going to be my earnest endeavor to retain the many friends I have made.

"My reasons for resigning and accepting another position are that my new work will take me out of doors, be somewhat more active, and relieve me from all office routine."

A special executive board meeting has been called for June 8, at which time an endeavor will be made to secure Mr. Hubbard's successor.

Mr. Hubbard's new activities will be announced in the near future when his plans have been completed.

William J. Kuntz Is General Manager of New Company

THE U. S. Dryer and Machinery Co., York, Pa., has been formed with a capital of $150,000, to manufacture lime kilns, both the rotary and shaft types as well as cylindrical double-shell driers of the Ruggles type; also sugar machinery, gas producers, gray iron castings, and tank and plate work in general.

William J. Kuntz will be the general manager. He is thoroughly acquainted with the lime business, having been the general manager and treasurer of the Steacy-Schmidt Mfg. Co., York, Pa., during which time he built the Keystone shaft kiln.

The shaft lime kiln which this new concern will build will be adapted to the use of coal, wood, oil, or gas as fuel, and will contain quite a number of new features, the development of Mr. Kuntz's experience in the manufacture and use of the old type Keystone kiln.

The company has purchased the plant formerly occupied by the York Bridge Co. and the Cochrane Brass Foundry which is a plot of 11 acres in York, on which is erected a number of buildings, the largest of which is 400x85 ft.

It is announced to the trade that the company will begin operations on June 1.

Fuller's Earth Production in 1921

THE output of fuller's earth in the United States in 1921 was 105,609 short tons, valued at $1,973,848, according to the Geological Survey. The quantity decreased 18 per cent and the value 21 per cent as compared with 1920. In 1921 the average value per ton at the mine was $18.69; in 1920 it was $19.51. Fuller's earth is found in many states, but in 1921 it was mined only in Alabama, Arkansas, Florida, Georgia, Massachusetts and Texas. Florida has been the leading state in production ever since the industry was established in this country, in 1895, and in 1921 it made 54 per cent of the total output. Georgia and Texas were second and third, respectively, in output and value.

When the bins are full this overflow provides additional storage to a total of 25,000 tons. The brick office building is at the end of the bins

Handling Potomac Sand and Gravel

A SAND and gravel plant has recently been constructed in Washington, D. C., by L. E. Smoot, on the Potomac river, to take material from the river deposits a few miles from the plant. Sand and gravel is dredged and towed in scows by tugs. On being brought alongside, the material is unloaded into a hopper by a stiff-leg derrick on a floating barge.

From this hopper the material falls on to a short conveyor belt which carries it to a small hopper located in the house shown in the lower right-hand corner of the lower left-hand photograph. The purpose of this belt is to gain elevation. If sand is being unloaded it falls from the second hopper directly on to a 24-in. conveyor belt, 400 ft. long from head pulley to tail pulley, which is driven by a 40-h.p. motor. The capacity of the belt is three tons per min.

If gravel is being unloaded, the material, on leaving the first belt, is carried into a revolving screen located over the belt and thoroughly rewashed; it has already received a first washing on the dredge. After this last washing, the gravel falls on the main belt, which elevates the material over a row of concrete hoppers 320 ft. long, which is subdivided into sections for the various grades. Its total capacity is 6,000 tons.

For the purpose of discharging the material into any desired compartment, the belt is provided with an automatic tripper which may be placed at any point along the trestle-work, and which discharges on either side. Underneath the storage bins are three one-way driveways through which trucks and teams drive to load from any one of 196 overhead chutes. A truck can be loaded with eight tons of material in less than 45 seconds. No provision has been made for loading trucks or teams by hand. After loading, the truck drives on to the weighing scales.

The wharf is provided with a siding adjacent to and on the east side of the concrete storage bins. Hopper cars and gondolas are placed on this siding and then spotted under a chute provided for the purpose, by means of a car-puller located in the shed at the end of the

The process in brief—from scow, by means of the unloading barge, to hopper, to short belt conveyor, to washing house, all shown at the left, then to the main belt and into bins, as shown at the right

siding, and loaded direct from the tripper as shown in the illustrations.

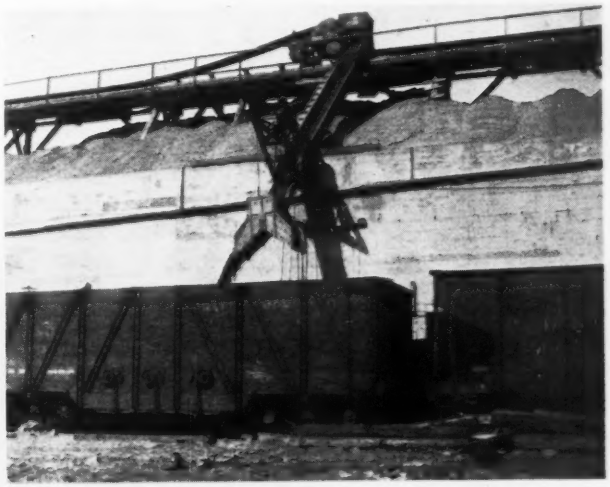
When the capacity of any particular compartment in the storage bin has been reached, the tripper is set to discharge on the west side of the trestle-work, and the material spills by gravity over the west wall on a storage pile just reaching a crane track when full. A locomotive crane then transfers this material to the other side of the track, or back into the storage bins as the case requires. The crane track is so located, and the elevation of the main belt with respect to it and to the west wall is such that the maximum storage for both bin and pile of 25,000 tons is obtained.

In addition to reclaiming material from the storage pile, the crane is used to unload scows. Similar to the short belt first mentioned, is another belt on the other side of the main belt and running to it from a hopper into which the crane bucket discharges. This method of ununloading, however, is resorted to only as a break down service.

As there is demand for special size gravel, a gravity screen is placed on each side of the trestle, over which the tripper may be placed. These screens remove a a part of the fine gravel which falls into a compartment of its own, allowing the tailings to fall into another section of the bin.

On the west side of the storage bins is this overflow storage, with its track and crane for handling. The swinging arm of the unloading barge can just be seen at the left

A new dredge, designed by L. E. Smoot and recently constructed, is nearly ready to commence operations, and its unusual methods of operating will be described in an early issue of Rock Products.



The tripper shown in the two upper illustrations can be set over any bin to unload from belt to storage, or direct into cars by the spout as shown. Below at the left is the shed housing the car puller, and at the right the truck runways with overhead loading gates

Handling Sand by Motor Truck

By J. Morley Zander
Saginaw Brick Co., Saginaw, Mich.

Because of high rates and poor railroad service, the Saginaw Brick Co. turned to trucks, with excellent results

WHEN the Saginaw Brick Co. plant was built in 1901, it seemed to the stockholders that they had an inexhaustible supply of sand right at the factory door. Had the output remained as small as it was the first two years, the question of transportation of sand from a distance would only now be up for consideration.

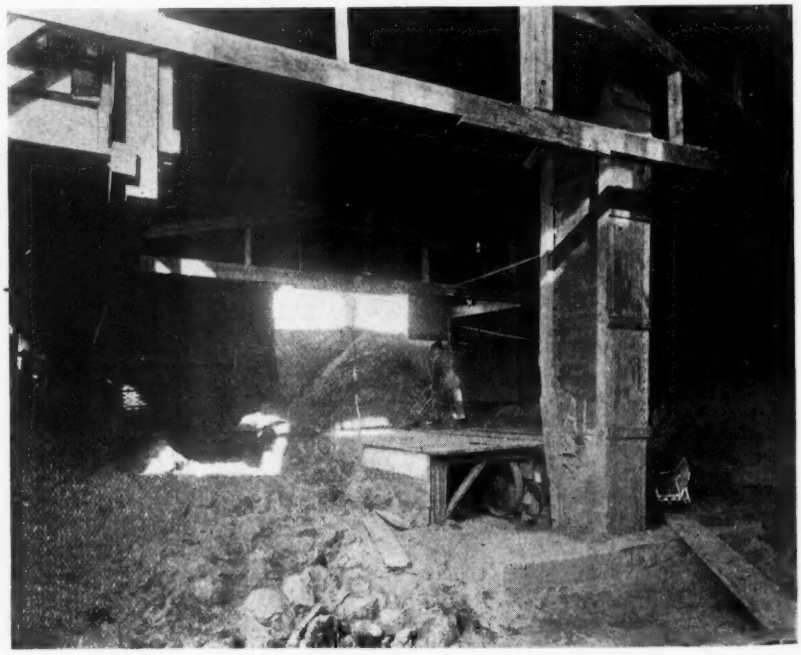
How the Saginaw Brick Co. secures its sand

The first move toward securing additional sand was to purchase an extensive ridge of exceptionally clean sand about seven miles west of the plant. This pit was operated by hand, the sand being loaded into gondolas on a siding which extended into the pit. This siding was short—the ridge crossed the railroad—and not very expensive to lay, as the railroads in those days were quite willing to assist in the construction of sidings that meant increased business for them. Although the sand bank was about 30 ft. high and most of the sand was handled down hill to the cars, hand loading was most expensive and therefore a gas-driven shovel was secured; it has proven very satisfactory.

This shovel has a capacity of about 30 cu. yd. per hour and can be operated by one man. For several years sand was shipped to the factory by rail in increasing quantities, as the sand at the plant became thinner and covered a decreasing area. This method of getting in sand by railroad cars seemed to be a solution of the sand supply question, and in 1917 plans were made to install suitable unloading apparatus. At this time, however, the freight rates began to advance and the railroad service to deteriorate, and sand by cars was a source of never-ending trouble and expense. Therefore, some other means of getting sand had to be found, and found quickly.

There were several likely sand hills within a few miles of the plant, but the transportation of material was a serious question. Finally, in negotiating for and testing out various sand properties a man was found who owned a tract of land and wanted to truck the sand to the factory. This sand was a little too fine unless mixed with the sand from the railroad—from the Swan Creek pit, as we termed it—but this difficulty was more easily overcome than that of securing all the sand by rail, for by this time the factory sand was entirely gone. So in 1919 we began trucking sand a distance of six miles. The truck used was a special machine of a semi-trailer or six-wheel type, with four hoppers, and it carried 6 yd. each trip.

A gas shovel, similar to the one in the Swan Creek pit, was installed and one man handled both the truck and the shovel. While this arrangement of mixing the truck sand and the railroad sand



Showing the conveyor in the tunnel and the building

worked out satisfactorily, it was soon discovered that if we built a bridge so that the truck was elevated when dumping at the factory, our sand-handling could be reduced to a minimum.

This was done, and the result was that truck sand cost us considerably less than the railroad sand. This determined the officers to continue the search for a sand suitably located and of the right quality, so that it could be used without mixing. In August of this past year a hill was purchased and the trucking apparatus moved to that location. Now our factory is getting practically all of the sand by truck, although the railroad pit is still kept in readiness to produce sand if it is needed.

When the trucks reach the factory they are driven on to the bridge, which is just outside the sand storage and about 10 ft. above the floor level. The high level of this bridge is about 200 ft. long and the trucks dump sideways into the building or over the side of the bridge beyond the building. At the point where the trucks dump into the building is a belt conveyor in a tunnel under the floor. This tunnel is open its entire length, but the opening is only about 10 in. wide. Sand can be put into the conveyor at any point of its length. This conveyor discharges into a vertical bucket elevator as the sand car has to be elevated sufficiently high to cross the railroad track which runs through the building. This belt conveyor, while installed to carry sand from the dump to the elevator or from any intermediate point, also makes an excellent feeder for the elevator and has increased its capacity.

The conveyor is run by a 3-hp. electric motor and has carried as high as 15 cu. yd. of sand per hour for 10 hr., or 150 cu. yd. in one day. When more sand is dumped into the storage building than is needed at the machines, the surplus is carried back into the sand storage by means of a small power scraper, which automatically loads and unloads and requires but one man to operate it. It is run by a 7½-hp. motor, the operator merely throwing either drum into gear by means of a friction. This scraper runs at right angles into the belt and can be used to carry sand away from the dump to either end of the building or back to the conveyor from either end of the building or from the outside storage, located beyond the end of the building and between the railroad and the truck bridge.

The development of this system has taken some time to work out, but its use is very satisfactory as the sand shed is handled by one man and the method of handling permits great flexibility. The truck contractor has all the freedom necessary to arrange his work in the most profitable manner and the factory goes along steadily producing its regular quota of 50,000 brick per day.

Lime Association Program

ON June 13 to 16 will be held the annual convention of the National Lime Association at the Hotel Statler, Cleveland. The following is the program:

TUESDAY, JUNE 13

Joint meeting of the staff of the central office and regional bureaus to confer on work in hand, fix a better basis for co-operation, and propose new lines of work.

WEDNESDAY, JUNE 14

10:00 A. M.—Assembly, roll call, and addresses by President Warner and representatives from various sections.

10:30 A. M.—Lime Burning in Rotary Kilns. By Irving Warner, Plants Manager the Charles Warner Co., Wilmington, Del.
Forum: Lime Kiln Efficiency. Question sheet and two-minute talks from the floor.

11:30 A. M.—Symposium: Lime for Chemical Industries; What Are the Problems of the Chemical Users of Lime?
1—The Alkali Industry. By R. G. Snowden, Hooker Electro-Chemical Co., Niagara Falls.
2—The Glass Industry. By R. P. Shiveley, Monongahela Glass Co., Fairmount, W. Va.
3—The Soda and Sulphate Paper Pulp Industry. By G. K. Spence, New York and Pennsylvania Paper Co., Johnsonburg, Pa.
4—The Soap Industry. Speaker to be announced.

12:40 P. M.—Appointment of Convention Committee.

1:00 P. M.—Complimentary luncheon, including address of welcome by Hon. Newton D. Baker, ex-Secretary of War and president of the Cleveland Chamber of Commerce.

2:30 P. M.—Symposium Continued:
5—Water Softening. By S. G. Hadden, Editor "Municipal Engineering," Indianapolis.
6—The Textile Industry. By Elton R. Darling, professor of chemistry, James Milliken University, Decatur, Ill.
7—Sulphite Paper Pulp. By P. A. Paulsen, consulting engineer, Appleton, Wis.

3:30 P. M.—Observations on the Lime Industry in Europe. By John Kling, president Kelley Lime and Transportation Co., Cleveland.
Address by Col. C. W. S. Cobb, president Glencoe Lime and Cement Co., St. Louis.

3:45 P. M.—Mechanical Handling of Lime (Illustrated). By H. D. Pratt, the Link-Belt Co., Philadelphia.
Forum: General plant problems; question sheet and three-minute talks from the floor.

4:30 P. M.—A New Idea in Lime Barrels. By T. E. McNamara, Eagle Rock, Va.
What the Bureau of Mines Is Doing on Quarry Problems. By Oliver Bowles, engineer, Bureau of Mines.

THURSDAY, JUNE 15

9:30 A. M.—Symposium: Lime in Construction.
1—At the Bureau of Standards. By W. E. Enley, in charge of lime investigations, Bureau of Standards.
2—Lime in Concrete at University of Pennsylvania. By H. C. Berry, professor of structural materials.
3—Forum: Question sheet and three-minute talks from the floor.

11:30 A. M.—Lime in Crop Protection. By Prof. W. C. O'Kane, New Hampshire Agricultural College and chairman of Crop Protection Institute of National Research Council.
Forum: Lime in Agriculture. Question sheet and three-minute talks from the floor.

12:45 P. M.—Complimentary luncheon. Luncheon talks: How to Handle the Day's Work. By E. Elmo Martin, Cleveland.
Photograph will be taken of the convention attendants.
Afternoon Clambake and general good time on the Lake shore. In charge of Ohio members.

FRIDAY, JUNE 16

9:30 A. M.—Bearing of the Work of the Chemical Department on the Large Use of Lime in the Chemical Field. By Dr. M. E. Holmes, manager of chemical department.

10:00 A. M.—What I Have Found Out About Lime (with demonstration). By F. C. Mathers, professor of inorganic chemistry, University of Indiana.

10:15 A. M.—Forum: Lime in Chemical Uses. Question sheet and three-minute talks from the floor.

10:45 A. M.—The Value of Research to Industrial Associations. By E. R. Weidlein, director of research, Mellon Institute, Pittsburgh.

11:15 A. M.—The Lime Association, National and Regional: The Industry's Biggest Sales Organization. By President Warner.

11:30 A. M.—The Bone and Sinew of Association Work. By O. B. Towne, Waxed Paper Manufacturers' Association, New York City.
Forum: Putting Over Lime. Publicity Ammunition. Educational Pamphlets. Personal Work. Regional and National Opportunities. Question sheet and three-minute talks from the floor.

12:30 P. M.—Some New Angles on the Use of Lime in Agriculture. By J. A. Slipher, manager agricultural department.

12:45 P. M.—The High Points in the Construction Department Program of Lime Production. By W. A. Freret, construction department.

1:00 P. M.—Complimentary luncheon.
Outlook on the Business Conditions. By George A Coulton, vice-president the Union Trust Co.

2:30 P. M.—Business Session: Secretary Fippin's report and financial statements. Action on amendments to by-laws. Budget for 1922-23. Election of officers and reports on selection of directors. New business.

4:00 P. M.—Meeting of new board of directors.

Agstone Members at Marion

ANOTHER meeting full of pep was held by the National Agstone Association on May 24. The association and its friends were guests of the Marion Steam Shovel Company at Marion, Ohio, where all who attended were royally entertained. The business meeting considered a number of routine subjects, and a large part of the day was spent in inspecting the plant and grounds of the company.

Analyzing Detonating and Priming Mixtures

PUBLICATION of Technical Paper 282, "The Analysis of Detonating and Priming Mixtures," by C. A. Taylor and W. H. Rinkenbach, assistant explosives chemists, is announced by the Bureau of Mines.

In the examination and manufacture of explosives conditions are radically different. New materials and combinations are being tried as explosives and the variety of both is so great that it is impracticable to give a definite method of analysis applicable to even one class of explosives, such as detonating and priming compositions or dynamites. Consequenhtly, a real need exists for the adaptation of the methods followed in the analysis of stable materials to the sensitive compounds and mixtures used in explosives in order that the analyst will know how to proceed with maximum safety and confidence.

This paper is intended to satisfy part of this need and is a continuation of the publications on explosives analysis from the Pittsburgh laboratory of the Bureau of Mines. The methods given are those used in practical work and are not intended to fill the requirements of a research chemist working on a particular compound.

Quarried from Life

By Liman Sandrock

"Organization" Johnston, V. O.

SAID a publisher to a young author when returning his story: "Start your first chapter with something striking, to fix the reader's attention." When the MMs. came back it began:

CHAPTER ONE

THE DUCHESS EXPLODES

"OH hell!" cried the Duchess. Etc., etc.

We, too, racked our brains for a hot start-off for this sprightly biography of V. O. Johnston, guiding spirit and inspiration of the Lincoln Sand and Gravel Co., Lincoln, Ill., and whilom president of the National Association of Sand and Gravel Producers. That "V" had a volcanic likeness to Vesuvius; that "O." maybe, meant Omri or Obadiah—we didn't ask him; we even delved into Scott's "Fair Maid of Perth" to learn if our Johnston could claim kinship with the gentle Johnstone, follower of the Black Douglas. No use—and in exasperation we echoed the Duchess' heated ejaculation.

But our notes do tell us that our esteemed brother was born in the panic year of '73 on a farm in Ohio, the mother state of several other successful presidents.

V. O., like most live American boys, survived the measles, the birchen rod, the swimmin'-hole, the advice of his elders, and in due time entered Oberlin College, graduating in 1897. Three years later he was graduated from the Western Law School at Cleveland, having drank his fill of Blackstone on Coke (we nearly said Burton on Trent, which is an entirely different ale-ment), and practiced law in Cleveland for seven years. A crowded seven years, for he had been accepted by Mrs. Johnston, piled up a busy law practice, been inoculated with "organization" virus and acquired a knowledge of team-work—the latter an asset at home as well as abroad. So far, so good!

But when one battles against boulders, leaky flues, lack of money, training, experience, cutthroat competition, and overdrafts for four years—about all there is in sight is a million dollars' worth of experience, a knowledge of how to live without sleep, and an empty purse. And V. O. had this harrowing experience after assuming management of the Lincoln company for the first time.

Five years later he organized the Sabula Sand and Gravel Co. as president, treasurer, manager, superintendent, salesman, and general utility man. While resting, he worked on the books, acquired some lower freight rates and trained a colt—which might well have been called Grit, out of Sandandgravel.

In 1914, with his added knowledge, he again managed the Lincoln company, learning to be in two places, 200 miles apart, at one and the same time. He also dodged the overalls, for he began chumming with bankers, general freight-agents, and contractors.

Once more the fever of organization broke out and he formed the Barry Sand and Gravel Co., went through a serious car shortage, sold his product at 30 cents a ton—and made a little money. He also helped to organize the Illinois Producers' Association.

In 1918 he went through a strike, a

V. O. Johnston, president the Lincoln Sand and Gravel Co.

flood, and an increase in freight rates; worked for the Illinois $60,000,000 road bond issue; renewed his acquaintance with his family—doubtless made easier through his ability to plead a brief against "wilful absence." And still he was seeking a hobby!

It was in 1920-21 that the national association gave him his chance to tell the producing world how much he knew of freight rates and priorities. His continuous patronage of the railroads nearly put them on their feet financially. He knew all the bellhops, porters and taxi drivers in our 48 sovereign states, and tasted deep of their acquisitiveness. He did not make a hit with the I. C. C., however—but who has? He has heard more tales of operating troubles, freight-rate iniquities, and competitors' criminalities than any other man in the well-known round world—and registered sympathy for each complainant.

Mr. Johnston declares that his business organization had in the meanwhile learned to run itself better than he ever did and so, when the national presidency ceased to be his, he found himself without a job.

And now what? As V. O. does not give a whoop for golf, and he says farming is too expensive, he's thinking of advertising for one—something after this fashion:

SITUATION WANTED

YOUNG MAN wants a good paper route; subscribers must not be particular about regular, or early, delivery; good references; no pestering; will use colt Grit in business for sufficient remuneration; no questions asked or answered; money no object if chance to advance. Address V. O. J., care "Lincoln Headlight," Lincoln, Ill. **tf

They Said It!

GEORGE B. WOOD, president Rockland-Rockport Lime Corp.: "When a thing—a machine or a process—is correct in theory, it can be made to work out satisfactorily in practice if you work at it hard enough and long enough."

THE GUARANTEED GRAVEL AND SAND CO., Mankato, Minn.: "Gravel and sand users, get in touch with us or we will both lose money." Here follows some snappy reasons why this plant is urging more business, with a word or two for its "last word" equipment, etc. This paragraph smacks of free advertising, but there's a hint in it for other producers to go and do likewise.

GEORGE W. FOOSHE, secretary-treasurer Tri-State Road Material Association: "Local or territorial organizations can go only so far, however well they may be managed. The National Association can function properly and effectively only as it is supported by the associated organizations."

PRESIDENT ALEX W. DANN of the National Association of Sand and Gravel Producers: "For one body of men [the Interstate Commerce Commission] to hold in its power, answerable to no authority and subject to no check except as its own judgment may dictate, to wreck the business of any one industry, or group of industries, without notice and without making public the facts which lead them to take summary action—is unthinkable."

THE BEDOUINS, says *Paton's Monthly*, use as fuel a stone found near the Dead Sea which is called Stinkstein. As the Dead Sea has been dead a long time, this fact may have much to do with the name.

Editorial Comment

Will There Be Cars?

Serious complications in the freight car situation are easily possible as a result of the combination of lower rates on July 1, the continuing strike of the coal miners and the possibility of car priority orders. The first and natural result of the announcement of lower rates is to slow up freight shipments by delaying until after the lower rates become effective all shipments which can be held until that time. Materials for immediate use in road and building construction, of which large volumes are now under way, cannot be delayed, but considerable material for use after July 1 will be held for shipment until that time. Other commodities will be held back for July shipment, especially coal, purchases of which will be fairly light until after the more favorable rates become effective.

Then on July 1 will come the rush for cars of all kinds, with the probability that construction materials will share in the ensuing delays.

Coupled with this is the fact that it is getting to the time when coal must be shipped in large quantities into the Northwest and into New England for winter use. This alone makes a considerable demand on open-top cars. Add to this the fact that everywhere supplies of coal are being rapidly depleted because of the miners' strike, and a still further demand on cars is seen to be inevitable.

It is quite evident that producers must ship and urge the shipment of quantities of material during June, even at less advantageous freight rates. The naturally increased demand after July 1 resulting from lower rates will tax the available car supply to the limit in any case, and it's better to ship during June at higher freight rates than not to ship at all.

If car priority rulings come into existence again—and the Senate bill to remove this power from the Interstate Commerce Commission seems now to have little hope of passage—aggregate producers will be in the position they were in during 1920. They may be ready to supply the increasing demand, but they will be largely helpless because of the shortage of cars in which to ship.

Preparing for Profits

Producers do not need to be reminded of the constantly increasing figures of freight car loadings, nor the once more increasing business of iron and steel producers, nor the dropping figures on unemployment, to be assured that business is improving. The orders on the books are sufficient and satisfying evidence of better business—business which means activity and greater profit, or the change from loss to profit. Lower freight rates will give further impetus to purchasing and shipping.

Large volume of business alone, however, does not make profits. If the unit volume of business is transacted at a loss, then the bigger the business the greater the loss. Now is the time to look carefully to costs—and a cost system, properly installed, has frequently been a business-saver—to inspect each operation for more economical methods, to be sure there are no money-eating leaks.

Even though prices may creep up under the pressure of increased demand there is danger that that same pressure may be offered as the excuse for introducing wasteful and uneconomical practices merely to obtain the greater production desired. Many a business man has saved his business and increased his profits not by raising prices or increasing sales, but by producing more economically on the same volume and at the same price. With business increasing there is the temptation to overlook the economy of operation which formerly brought profits, and to let costly practices overcomes the beneficial effects of greater volume and higher price.

With the still greater volume anticipated when the lower freight rates become effective, there may be still further opportunity for economical operation. Can a new conveyor, an added motor, or some other new piece of equipment be made to reduce costs, and perhaps quickly pay for itself during a period of increased production? Anticipate the demand and prepare for it. And at all times watch costs and improve methods if increasing business is to be a real benefit.

Stop the Coal Strike

The coal situation, which on the surface at least has caused little disturbance among producers of lime, cement, and other materials where coal is important, appears to be getting more serious. Stocks which were large at the beginning of the strike are becoming depleted. It has been stated that consumption has been going on at the rate of 8,500,000 tons a week, with production at 5,000,000 tons a week. The country's reserve will not last forever when it is being eaten into at the rate of three and a half million tons weekly. Prudent producers still have supplies on hand, but they are looking to the time when they will need new supplies, and they face the possibility of greatly inflated prices. The scarcity and high price of coal has already made the basis of a rise in cement prices, and the prolongation of the coal strike may offset the advantages now enjoyed by rock products producers from the present stimulation of building activity. Increasing cement prices will retard construction and decrease the demand for aggregates and other building materials. It is time for the coal strike to stop.

Accident Prevention

How to Avoid Yard Accidents—Part II

ROLLS or pipe should be carefully blocked to prevent the pile from spreading. Roll piles should not be more than three high unless in racks; when of different lengths, the longer ones should be on bottom.

Much care is necessary also in piling cement or other heavy material in bags. The following rules are suggested:

(a) It should be piled on a level plant flooring not more than 10 bags high (except in storage for such purpose).

(b) The first four end bags should be cross-tied. At every fifth bag in height a step-back of one bag should be made.

(c) In unpiling, the pile should be kept at an even height and the necessary step-back maintained.

(d) The bags in outer tiers should have the mouth facing the center of pile.

(e) Do not pile against a wall unless it is of sufficient strength to withstand the pressure.

In the storage of sand, stone, coal and similar material it is desirable to have substantially constructed retaining walls or bins. These bins when constructed of wood often get badly out of repair; the planking soon becomes warped and bulges out and presents a constant source of danger to train crews and others. It is therefore desirable that retaining-walls or bins be of concrete construction and so located that permanent piles for specific material may be established. Concrete bins will save time, money, and trouble.

Frequent inspection of stock piles is necessary lest they become unsafe through the continual adding and withdrawing of stock. In the winter months the workmen will often undermine frozen sand, coal, and ash piles until they present a serious hazard. Such overhanging piles should be broken down by a pick, steam jet, box fire, or a drop-ball.

Oil and explosives should be stored as far as practicable from plant buildings and structures which might be injured by fire or explosion. The safest practice is to store such material in a remote part of the yard, except such small quantities as are needed for immediate plant operation. The local, state, and Federal laws regarding the handling and storage of explosives should of course be complied with.

In the piling of material clearance should be allowed between piles and railroad tracks or roadways to insure safety.

Car Equipment

Many of the larger companies operate plant railways and maintain in addition to standard rolling stock equipment hundreds of smaller transfer cars or buggies. Many serious and fatal accidents have been caused by the operation of these cars, largely in connection with coupling. Where conditions permit, the cars should be equipped with automatic couplers.

Push cars used on railroad tracks should be equipped with wheel guards or fenders. These serve the double purpose of safeguarding the feet of workmen and of pushing obstructions from the track.

Signal bells or horns should be installed on all power-driven plant equipment, and speed regulations specified by departments or locations.

The use of crowbars or pinchbars for starting or moving cars has resulted in many accidents. A car mover should be furnished for this purpose. The shifting of cars by means of a winch presents serious hazards because of the possibility of a cable breaking or a hook slipping off the car. If a winch or block-and-tackle is used, the best equipment should be provided and close inspection maintained.

The use of overhead cranes for shifting cars is inadvisable. Aside from the danger of the hook slipping or of lifting the cars off the tracks, this practice is injurious to the crane mechanism unless a block-and-tackle is used.

The regulations of the Interstate Commerce Commission governing car steps, hand-holds, footboards, and other appurtenances should be observed in the maintenance of plant rolling-stock so far as it is practical. Close inspection, adequate guarding, and prompt repairs will prevent many accidents to operatives and plant workmen.

Drops should be entirely surrounded by a substantial enclosure of sufficient height to stop all flying pieces as many serious accidents have been caused by flying material from these drops. Gongs or whistles are used in some plants to warn all persons that a drop is to be made.

Many accidents have occurred because wagons, trucks, and wheelbarrows have not been kept in proper repair, or because the workmen have used trucks too light for the material to be handled. Some companies paint the capacity of each truck on the side of the bed. There should be proper supervision of the loading of trucks, wagons, or wheelbarrows. If this is neglected the danger of workmen being caught by a falling load is greatly increased.

"As the Twig's Bent the Tree's Inclined"

WIDESPREAD attention and study are being given to teaching the child in the home the exceeding value of personal safety. Careless habits and ignorance of proper precautions first have their start in the home if there is not constant watchfulness on the part of those who have the care of the boys and girls. In the years to come these children become the men and women who labor with machinery and come in contact with the hazards of the many things that go to make up industrial equipment.

ROCK PRODUCTS thinks so highly of the recent effort of the Wisconsin Mineral Aggregate Association to spread the gospel of "safety first" in the homes of those

To Employees of Crushed Stone Sand and Gravel Producers Affiliated with the Wisconsin Mineral Aggregate Association

Believing the subject worthy of study by everybody and that it has possibilities for a short story, we hereby make offer of cash prizes for the First, Second and Third best short stories on "SAFETY FIRST", to be written by children of employees engaged in the production of sand, gravel and crushed stone. *Children of owners of plants are not eligible to compete.* **Stories must be written on plain paper.**

The following rules to govern this contest:

Any boy or girl, up to sixteen years of age, who is a child of an employee of a Member of this Association, is invited to write a story on the above subject.

Story shall not exceed 200 words.

Any feature of the "Safety First" question may be covered and will be considered.

$25.00 in cash will be paid for the story considered best, $15.00 for the one ranking second, and $10.00 for the third.

The contest is open until July 1st, 1922, and all stories received up to midnight of that date will be submitted to the Wisconsin Industrial Commission, at Madison, for the selection of the first, second and third choice.

Stories are to be sent to the above Association, 1018 Railway Exchange Bldg., 97 Wisconsin St., Milwaukee, Wisconsin.

Wisconsin Mineral Aggregate Association

O. C. HUBBARD, Executive Secretary

This is one meritorious way in which accidents may be prevented in future

who are engaged in the rock products industry that it reproduces the commendable offer made to the children of the employes of our producers.

This good work is well worthy of emulation by other associations and producers. It will surely reap fine crops from the good seed thus sown. Undoubtedly. Secretary Hubbard will be glad to give any one interested the benefit of his study of accident prevention and offer suggestions that will be of material benefit.

New Machinery and Equipment

A New 20-Ton Steam Shovel

REDESIGNING of the new 20-ton B Erie shovel has been completed by the manufacturers, the Erie Steam Shovel Co., Erie, Pa. The object has been to provide extra protection against accident and abuse. It is said that this new machine has hoisting power enough to handle a ¾ cu. yd. dipper (water measure) with a 21 ft. boom and 18 ft. 6 in. dipper handle.

Improvements in the trucks include a reinforced frame of stronger design and heavier propelling shaft, with ample strength to stand severe abuse. Split collars are provided on the rear axle for throwing the propelling gears out of mesh in a few minutes' time so that the shovel can be towed behind a motor truck at a speed of from three to four miles per hour.

The traction wheel mounting is interchangeable either with car wheels or with the Erie lubricated caterpillar type of mounting. The turntable casting has been reinforced with flanged webs and has guards to keep water off the cone-roller path so that this path remains dry and the rollers do not slide.

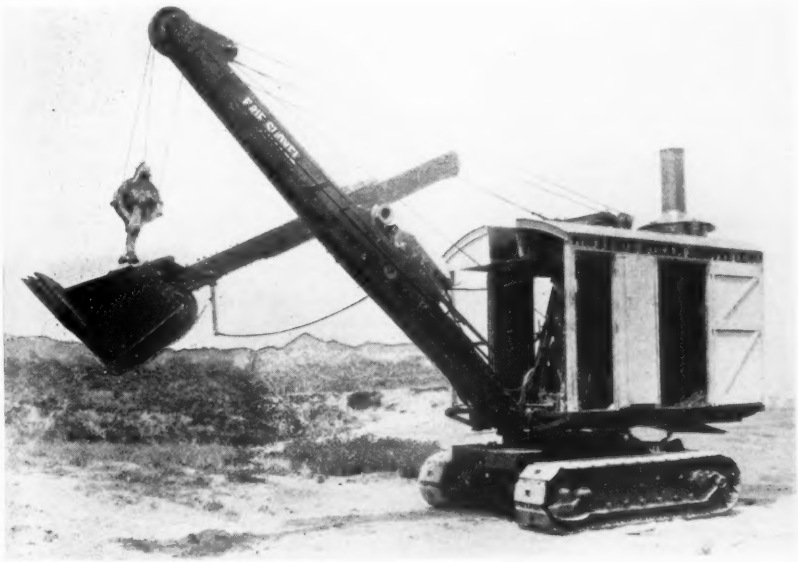
Other features include a boom hoist which provides quick accessibility for the hoisting-engine crankshaft bearing; the worm gears of the boom hoist run in oil; the hoisting engine crankshaft is heavier. There is a three-feed oil pump for lubricating the hoisting, swinging, and crowding engines, heavy brass piping being used.

Another improvement is the design of the main swinging shaft bearing, the bushings being easily renewed by the insertion of interchangeable bronze bushings. Smoother operation at high speed is had by machine-cutting all gears on the hoisting, swinging and crowding trains. The boom provides greater strength in hard digging, the supporting lugs being placed outside the boom to compact the boom members when the boom is subjected to twisting strains and the heavy steel shipper-shaft boxes on high lift machines are cast together. The automatic tripping device makes the operator's work much easier.

A drum turns with the shipper-shaft and keeps the trip rope taut, automatically winding and unwinding the trip rope as the dipper handle is moved. The dipper has a double-hinged latch lever which moves freely from side to side and does not bend if it strikes a car or wagon, nor can it break wagon boxes or car sides. It has been strengthened by a heavier lip and stronger hinges.

At the power-producing end there is a larger boiler with a steaming capacity up to the full limit. To economize fuel this shovel has an auxiliary exhaust of advantage when the shovel has been idle and water has accumulated in the engines.

All of this water can be blown out through the auxiliary exhaust pipe instead of projected through the stack. Other features include a safety guard on the water glass; there is a tank water-gage, a hood and stack producing uniform draft, even under widely varying operating conditions. The new ashpan guard prevents the pan from being struck when swinging in close quarters. This shovel can be converted to a locomotive crane to handle a clamshell, orangepeel or a dragline bucket. It also handles hard materials and large boulders. The many improvements include fair leads for dragline service, lengthening the drag-cable life, clamshell control to speed up the hoisting and closing action when the bucket is handled. In announcing this new design the company also claims that higher standards of workmanship and construction are being maintained than have been possible since 1916, as better materials can be secured than were available under wartime conditions.



The redesigned Erie 20-ton shovel

Hydraulic Press for Heading Barrels

THE Skinner Machinery Co., Dunedin, Fla., has put on the market a hydraulic barrel-heading press. This machine is entirely self-contained, claim the manufacturers. The pump supplying the pressure is mounted directly on the base of the machine and connected by a short nipple to the base casting. In this casting are the various oil passages and the rotary valve controlling the operation of the plunger. The plunger is 5 in. in diameter, thus giving a high pressure on the barrel without a very high oil pressure.

The oil reservoir is cast directly into the base of the machine. The press operates as follows: Pressing the left-hand pedal causes it to rise; removing the foot from the pedal stops the raising operation but does not lower the barrel; thus the barrel is held in position for nailing the head. Pressing the right-hand pedal causes the barrel to lower. The speed of operation is determined by the speed of the pump.

This machine is equipped for electric motor drive, although it can be equipped for belt drive, in which case the belt pulley is placed below the floor and mounted directly on the pump.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	.....
Buffalo, N. Y.			1.30 per net ton all sizes			
Burlington, Vt.	1.00	.....	2.50	2.00	2.00	.....
Chaumont, N. Y.	1.00	.....	1.50	1.25	1.25	1.25
Cobleskill, N. Y.	1.25	1.25	1.15	1.15	1.15	.....
Coldwater, N. Y.		1.50 per net ton all sizes; fluxing stone 1.80 per ton				
Eastern Penna.	1.10	1.35	1.35	1.35	1.35	1.35
Munns, N. Y.	1.00	1.25	1.25	1.25	1.25	1.25
Prospect, N. Y.	1.00	1.25	1.25	1.25	1.25	.....
Western New York	1.00	1.20	1.20	1.20	1.20	1.20
CENTRAL						
Alden, Ia.	.80@1.00	.80@1.00	1.50	1.45	.....	.....
Alton, Ill.	2.00	.....	1.50	1.35	1.35	.....
Buffalo, Iowa	1.00	.....	1.15	.95	1.00	1.00
Chicago, Ill.	1.20	1.60	1.20	1.20	1.20	1.20
Dundas, Ont.	1.00	1.35	1.35	1.25	1.10	1.10
Faribault, Minn.	.....	.....	.....	.....	1.75	.....
Greencastle, Ind.	1.25	1.00	1.00	.90	.90	.90
Illinois, Southern	1.75	1.60	1.50	1.50	1.40	.....
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.50
Kokomo, Ind.	1.10	1.25	1.25	1.10	1.10	1.10
Krause or Columbia, Ill.	1.35	1.20	1.20	1.10	1.10	1.10
Lannon, Wis.	.80	.....	.90	.....	.80	.80
Marblehead and Brillion, Wis.	1.10	.....	1.20	1.10	1.10	.....
Mitchell, Ind.	.90	.....	.....	.....	.....	.....
Montreal, Canada	.85	1.20	1.10	1.05	1.00	.....
Montrose, Ia.	.....	1.50	1.60	1.55	1.50	.....
River Rouge, Mich.	1.00	1.10	1.10	1.10	1.10	1.00
Sheboygan, Wis.	1.00	1.10	1.10	1.10	1.00	.....
Southern Illinois	1.35	1.20	1.20	1.20	1.20	.....
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.25	1.35	.....	.....
Stone City, Iowa	.75	.....	1.40	1.30	1.25	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
			Prices include 90c freight			
Valmeyer, Ill.	1.60	1.30	1.30	1.30	1.30	1.30
Waukesha, Wis.			all sizes 1.10 per ton			
SOUTHERN:						
Alderson, W. Va.	1.10	1.35	1.65	1.35	1.35	.....
Bromide, Okla.	1.50	.....	.....	1.50	1.50	.....
Cartersville, Ga.	.....	2.00	2.00	1.40	1.40	1.40
Chickamauga, Tenn.	.90	1.00	1.00	1.00	.90	.....
Dallas, Texas	1.00	1.00	1.00	1.00	1.00	1.00
El Paso, Tex.	1.00	1.00	1.00	1.00	1.00	.....
Gainesville, Ga.	1.00	1.25	1.25	1.25	1.25	1.25
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	2.00	2.00	2.00	1.50	1.50	1.50
Morris Spur (near Dallas) Tex.	1.00	1.25	1.25	1.25	1.25	1.00
Portland, Ga.	.60@1.00		(All other sizes 1.00@1.25)			
Shephard, Tenn.	1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.....
WESTERN:						
Atchison, Kans.	.50	1.80	1.80	1.80	1.80	1.80
Blue Springs and Wymore, Neb.	.20	1.65	1.65	1.55	1.45	1.40
Cape Girardeau, Mo.	1.50	.....	1.50	1.50	1.25	.....
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.40

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Bernardsville, N. J.	2.00	2.20	2.00	1.80	1.50	.....
Branford, Conn.	.60	1.50	1.25	1.15	1.00	.....
Bound Brook, N. J.	1.80	2.30	1.90	1.50	1.40	.....
Dresser Jct., Wis.	1.25	2.25	2.25	2.00	1.50	1.50
Duluth, Minn.	.90@1.00	2.25	1.90@2.00	1.40@1.50	1.30@1.40	1.30@1.40
E. Summit, N. J.	2.10	2.30	2.00	1.70	1.40	.....
Eastern Mass.	.60	1.85	1.60	1.50	1.50	1.50
Eastern New York	.75	1.60	1.60	1.40	1.40	1.40
Eastern Penna.	1.25	1.65	1.50	1.40	1.30	1.30
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.50	1.25	1.15	1.00	.....
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	1.75
Richmond, Calif.	.50*	.....	1.75*	1.50*	1.50*	.....
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Springfield, N. J.	2.00	2.10	1.80	1.60	1.50	.....
Westfield, Mass.	.60	1.35	1.25	1.10	1.00	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Alexandria Bay, N. Y.	1.60	.....	1.30	1.50	1.30	.....
Dell Rapids, S. D.—Granite	.75	1.85	1.75	1.70	1.70	.....
Dundas, Ont.—Flint	1.00	1.50	1.50	1.50	1.25	1.20
Eastern Penna.—Sandstone	.85	1.60	1.50	1.35	1.35	1.35
Eastern Penna.—Quartzite	.90	1.35	1.20	1.20	1.30	1.30
Ft. Springs, W. Va.—Granite	1.00	1.25	1.40	1.25	1.20	.....
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Los Angeles, Cal.—Granite	.....	1.25@1.50	1.15@1.40	1.15@1.40	.....	.....
Macon, Ga.—Granite	.50	.....	2.50	2.25	2.00	1.25@1.90
Middlebrook, Mo.—Granite	3.00@3.50	4.00@5.00	.....	2.00	.....	1.25
Sioux Falls, S. D.—Granite	.75	1.85	1.75	1.70	1.70	.....
Utley, Wis.—Red Granite	1.35	1.40	1.30	.....	1.20	.....

*Cubic yard. †Agrl. lime. ||R. R. ballast. §Flux. ‡Rip-rap. a 3-inch and less.

Agricultural Limestone

EASTERN:

Chaumont, N. Y. — Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$ — Thru 100 mesh; sacks, 4.00; bulk 2.50

Grove City, Pa. — Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$—100% thru 20 mesh, 60% thru 100 mesh, 40% thru 200 mesh; in 80 lb. paper sacks, 4.50; bulk 3.00

Hillsville, Pa. — Analysis, 96.25% $CaCO_3$—Raw ground; sacks, 4.50; bulk 3.00

Jamesville, N. Y. — Analysis, 89.25% $CaCO_3$, 5.25% $MgCO_3$; sacks, 4.00; bulk 2.50

New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk 3.00

Osborne, Pa.—45% thru 200 mesh, 60% 100 mesh, 100% thru 20 mesh; 4.50 sacks; bulk 3.00

Texas, Md.—Analysis, 58.02% $CaCO_3$, 37.3% $MgCO_3$—50% thru 50 mesh; bags, 4.25; bulk 2.50

West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.25—cloth, 4.75; bulk.... 3.00

Williamsport, Pa. — Analysis, 90% $CaCO_3$, 2% $MgCO_3$—50% thru 50 mesh; paper, 4.75; bulk..... 3.75

CENTRAL:

Alton, Ill. — Analysis, 98% $CaCO_3$, 0.3% $MgCO_3$—90% thru 100 mesh.... 4.00

Bedford, Ind. — Analysis, 98.5% $CaCO_3$, .5% $MgCO_3$—90% thru 10 mesh 1.50

Belleville, Ont. — Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk 2.50

Bellevue, Ohio — Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh..... 1.25

Bettendorf, Ia., and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$—50% thru 100 mesh; 50% thru 4 mesh..... 1.50

Buffalo, Ia.—90% thru 4 mesh..... 1.00

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$ (90% thru 50 mesh, 2.00), 50% thru 4 mesh..... 1.50

Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$—90% thru 4 mesh.... 1.00

Columbia, Ill., near East St. Louis—⅛-in. down ..... 1.25@1.80

Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh..... 1.80@3.80

Elmhurst, Ill. — Analysis, 35.73% $CaCO_3$,, 20.69% $MgCO_3$—50% thru 50 mesh 1.25

Greencastle, Ind. — Analysis, 98% $CaCO_3$—50% thru 50 mesh..... 2.00

Kansas City, Mo.—50% thru 100 mesh 1.50

Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh..... 1.35

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$—90% thru 50 mesh..... 2.00

Marblehead, Ohio — Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$—50% thru 52 mesh, 50% thru 59 mesh, 100% thru 10 mesh; bags, 4.50; bulk..... 3.00

Milltown, Ind. — Analysis, 94.41% $CaCO_3$, 2.95% $MgCO_3$—40.8% thru 100 mesh, 61.2% thru 50 mesh..... 1.40@1.50

Mitchell, Ind. — Analysis, 97.65% $CaCO_3$, 1.76% $MgCO_3$—pulverized limestone 1.50

Montrose, Ia.—50% thru 100 mesh..... 1.35

Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh..... 1.50@2.00

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.25@1.50

Piqua, O.—100% thru 10; 80% thru 50; 70% thru 100..... 3.25@5.00

99% thru 10; 55% thru 50; 40% thru 100 ..... 1.75@2.00

River Rouge, Mich. — Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk..... .80@1.40

Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ¼-in. mesh..... 1.30

Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 30 mesh..... .75

(Continued on next page)

Agricultural Limestone

(Continued from preceding page.)

Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh 1.50
Waukesha, Wis.—No. 1 kiln dried..... 2.00
No. 2 Natural..... 1.75
Whitehill, Ill. — Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$—90% thru 100 mesh 5.00
90% thru 50 mesh..... 1.35
Yellow Springs, Ohio—Aanlysis 96.08% $CaCO_3$, 63% $MgCO_3$, 32% thru 100 mesh; 95.57%, sacked, 6.00; bulk.... 4.25

SOUTHERN:

Alderson, W. Va.—90% thru 50 mesh 1.50
Barber, Va.—Analysis, 92 to 98% $CaCO_3$—Bags, 6.50; bulk..... 4.50
Blowers, Fla.—Analysis, 98% combined carbonates—75% thru 200 mesh..... 4.75
Cape Girardeau, Mo. — Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$ — 50% thru 100 mesh 2.00
90% thru 4 mesh..... 1.50
Cartersville, Ga.—Analysis, 55% $CaCO_3$, 42% $MgCO_3$—all passing 10 mesh..... 2.00
Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$—90% thru 100 mesh, 4.00; 50% thru 100 mesh, 3.00; 90% thru 50 mesh, 3.00; 50% thru 50 mesh, 2.75; 90% thru 4 mesh, 2.75; 50% thru 4 mesh..... 2.75
Ft. Springs, W. Va. — 50% thru 100 mesh 3.00
Hot Springs, N. C.—90% thru 100 mesh, sacks, 4.25; bulk..... 3.00
Knoxville, Tenn.—Pulverized 2.50
90% thru 100 mesh..... 2.00
90% thru 50 mesh..... 1.50
Ladds, Ga.—90% thru 50 mesh..... 2.00
Linnville Falls, N. C.—Analysis,, 53% $CaCO_3$; 42% $MgCO_3$—50% thru 100 mesh; sacks, 4.50; bulk..... 3.00
Mountville, Va. — Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—X thru 20 mesh; sacks 5.00

WESTERN:

Colton, Calif.—Analysis, 95% $CaCO_3$, 2-4% $MgCO_3$—all thru 14 mesh—bulk 4.00
Garnett, Okla.—Analysis, 86% $CaCO_3$, 50% thru 4 mesh ..... .50
Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk..... 1.80
Terminous, Calif. — Analysis, 97.3% $CaCO_3$, .04% $MgCO_3$—65% thru 200 mesh, 90% thru 100 mesh, 95% thru 80 mesh, 100% thru 50 mesh; sacks, 5.00; bulk 4.50
Tulsa, Okla.—90% thru 4 mesh..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Baltimore, Md. 2.25
Berkley Springs, W. Va..... 1.75@2.00
Cedarville and South Vineland, N. J.—Damp, 1.75; dry..... 2.25
Cheshire, Mass. ..... 5.00@8.00
Columbus, Ohio—Glass sand..... 1.25
Dunbar, Pa.—Damp 2.00
Falls Creek, Pa. 2.50
Hancock, Md.—Damp ..... 2.50@3.50
Klondike and Pacific, Mo..... 1.75@2.50
Mapleton, Pa. ..... 2.25@2.50
Massillon, Ohio 3.00
Millington, Ill. 1.75
Mineral Ridge, O..... 2.50
Green 2.25
Montoursville, Pa. 1.75
Oregon, Ill.—Glass sand..... .75
Pittsburgh, Pa.—Dry, 4.00; damp..... 3.00
Rockwood, Mich. ..... 2.50@2.75
Round Top, Md.—Dry..... 1.25
St. Mary's Pa.—Unwashed..... 2.00
Thayers, Pa. ..... 2.00@2.50
Utica, Ill. ..... 1.00@1.25
Zanesville, Ohio ..... 2.00@2.50

FOUNDRY SAND:

Albany, N. Y.—Sand blast..... 4.00
Molding fine and brass molding..... 2.00
Molding coarse 1.75
Allentown, Pa.—Core and molding fine 1.50@1.75
Arenzville, Ill.—Molding fine..... 1.40
Beach City, O. — Core, washed and screened ..... 2.00@2.50
Furnace lining ..... 2.50@3.00
Molding fine and coarse ..... 2.25@2.50
Cheshire, Mass.—Furnace lining, molding, fine and coarse..... 5.00
Sand blast ..... 5.00@8.00
Stone sawing 6.00
Cleveland, O.—Molding coarse..... 1.50@2.00
Brass molding ..... 1.50@2.00
Molding fine ..... 1.50@2.25
Core ..... 1.25@1.50
Columbus, O.—Core ..... .30@1.75
Sand blast ..... 3.50@5.00
Furnace Lining 1.50
Molding fine 2.00
Molding coarse 1.75

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Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Attica, N. Y.	.75	.75	.75	.60	.60	.60
Ambridge and So. Heights, Pa.		1.15	1.15	1.15	.70	.70
Buffalo, N. Y.	1.10	.95	.85	.85	.85	.85
Erie, Pa.	1.00		1.00		1.25	
Farmingdale, N. J.	.48	.48	1.50	1.30	1.20	1.20
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.50	1.75	1.35	1.35	1.25
Ludlow, Mass.	.75•	.75•	1.70		1.50•	1.50•
Philadelphia, Pa.	.75	.75		1.40	1.25	
Pittsburgh, Pa.	1.15	1.15	1.15	1.15	.70	.70
Portland, Maine		.50	1.75		1.35	1.35
Texas, Md.		1.00		Pure white sand, 1.50		
Washington, D. C.	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.40	.40				.90
Attica and Covington, Ind.	.90	.90	.90	1.00	1.00	1.00
Barton, Wis.		.60	.70	.70	.70	.70
Beloit, Wis.		.50			.50	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00
Des Moines, Ia.	.50	.40	1.50	1.50	1.50	1.50
Detroit, Mich.	.65	.65	.95	.95	.95	.95
Earlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.40	.40	1.25	1.00		.90
Elkhart Lake, Wis.	.70	.58	.90	.90	.72	.72
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		.50		.80		.70
Greenville, Mechanicsburg, O.	.65	.65	.65	.65	.65	.65
Hamilton, Ohio		.90			.90	
Hawarden, Ia.		.50			1.60	
Hersey, Mich.		.40			.80	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Le Mars and Doon, Ia.		.90		1.80		
Libertyville, Ill.		.50		.70		
Mankato, Minn.	.40	.40	.75@1.25	.75@1.25	.75@1.25	.75@1.25
Mason City, Ia.	.65	.55	1.80	1.70	1.60	1.55
Milwaukee, Wis.	1.06	1.06	1.26	1.26	1.26	
Minneapolis, Minn.	.35	.35	1.25	1.25	1.25	1.25
Moline, Ill.	.60	.60	1.20	1.20	1.20	1.20
Riton, Wis.		.40			.60	
St. Louis, Mo., f. o. b. cars	1.10	1.30	1.50	1.30		1.25
St. Louis, Mo., delivered on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.65	.65	.65	.75	.75	.75
Terre Haute, Ind.	.60@ .75	.60@ .75	.75	.75	.75	.75
Waukesha, Wis.	.60		All other sizes, .70 per ton			
Winona, Minn.	.40@ .50	.40	.80@1.00	.80@1.00	.80@1.00	.80@1.00
Yorkville and Moronts, Ill.	.80	.60@ .80	.60@ .80	.60@ .80	.60@ .70	.60
SOUTHERN:						
Alexandria, La.		.70			1.20@1.35	
Birmingham, Ala.	1.48		all gravel—1.88			
Charleston, W. Va.		1.45	1.50	1.50	1.50	1.50
Estelle Springs, Tenn.	1.15	1.00	1.00	1.00	.85	.65
Ft. Worth, Tex.		2.00		2.00		2.00
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	1.00	1.00	1.75	1.50	1.50	1.50
Lake Weir, Fla.		.60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.12	1.12				1.95
N. Martinsville, W. Va.		1.00		1.20		.80
New Orleans, La.		.50			1.00	
Pine Bluff, Ark.	1.20	.90	Washed gravel, all sizes, 2.25			
Roseland, La.		.25	.85	.85		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Jedburg, Mo.	.70	1.20	.95	.75	.75	.70
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton, Missouri River, .85)					
Los Angeles, Calif.		.75	1.25	1.25	1.15	1.15
Niles, Calif.	1.00	1.00	1.40	1.00	1.00	1.00
Pueblo, Colo.	1.10•	.90•		1.25•		1.50•
San Diego, Calif.	.80@1.00	.80@1.00	1.30@1.60	1.25@1.55	1.15@1.45	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.50•	1.50•	2.00•	1.50•		1.50•
Yutan, Neb.	.40		Bank run .40			

Bank Run Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
Attica, Covington, Silverwood, Ind., and Palestine, Ill.	.75	.75	.75	.75	.75	.75
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Ia.			.80 per ton—1.20 washed			
Dudley, Ky. (Crushed Sand)		1.00		.95		
East Hartford, Conn.			.65 per cu. yd.			
Estelle Springs, Tenn.						.85
Fishers, N. Y.	.50@ .65			.50@ .65		.50
Hamilton, O.			.40 per cu. yd. in pit			
Hartford, Conn.		1.00•				
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Tex.		.95				.55
Janesville, Wis.		.65			.65@ .75	
Oxford, Mich.				.65	.65	
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f. o. b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.40			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Texas		.80		1.50		1.30
Winona, Minn.			Clean pit run .50@.60			
York, Pa.		.90@1.10		(crushed rock sand)		

•Cubic yard. B Bank. L Lake. ‖ Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	1.25	1.25	1.25	1.25	1.25	1.25	1.25
E. Canaan, Conn.	4.00	1.00	2.50	1.25	1.15	1.10	1.10
Eastern Pennsylvania and Northern New Jersey	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.00	.80	1.25	.90	.90	.90	.90
Erie, Pa.	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Emporium, Pa.	1.25	1.25	1.25	1.25	1.25	1.25	1.25
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, $1.50, F. O. B. Chicago				
Detroit, Mich.			All sizes, 1.65, F. O. B. Detroit				
Ironton, O.	2.05		Other grades 1.45				
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.92	1.67	1.77	1.77	1.77	1.67	1.67
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	(Any delivery in city except team track deliveries) 1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.00	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
EASTERN:								
Adams, Mass.			7.00					3.50
Bellefonte, Pa.			8.00	9.00	8.00		7.00	
Berkley, R. I.			12.00					2.30
Buffalo, N. Y.		11.00	11.00	11.00			9.50	2.00•
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.00	
Paxtang and LeMoyne, Pa.					5.00		4.75@5.00	
Union Bridge, Md.			13.00		5.50			
West Rutland, Vt.	13.50@14.00	11.00@11.50	11.00@11.50	13.50	10.00		11.00	3.50
West Stockbridge, Mass.			15.00					
Williams and Blue Bell, Pa.			11.25					
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		10.50	10.50	12.50			8.00	
CENTRAL:								
Delaware, Ohio	10.50	9.00	8.00	10.00			8.00	1.50
Geneo, Ohio	10.50§							
Gibsonburg, Ohio	10.50§	9.00	8.50		7.25	9.25	8.00	
Huntington, Ind.	10.50	9.00	8.50				8.00	1.70•
Knowles and Valders, Wis.			12.50		5.00	9.00		
Luckey, Ohio	10.50	9.00	8.00				8.00	
Marblehead, Ohio		9.00	8.50				8.00	1.50•
Mitchell, Ind.		11.00	11.00	11.00	9.50		8.50	1.45
Sheboygan, Wis.					5.50	8.50		
White Rock, Ohio	10.50				7.25	9.25		
Woodville, O. (dlrs.' price)	10.50a	9.00a	8.00a	10.00a	7.25		8.00	1.50
SOUTHERN:								
El Paso, Tex.							12.50	
Karo, Va.							7.00	1.30
Knoxville, Tenn.	22.00	9.50@11.00	9.50	9.50	8.00	9.50	7.50	1.30
Ocala and Zuber, Fla.	12.00				11.00	10.00		1.50
Sherwood, Tenn	11.00	9.50			7.50		7.50	
Staunton, Va.					8.00		9.50b	1.60
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. Mex.							12.50	
San Francisco, Calif.	22.00	22.00	15.00	22.00				2.15•
Tehachapi, Calif.							13.00	2.00

‡100-lb. sacks; •180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §Paper sacks. (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl.

Miscellaneous Sands

(Continued from preceding page)

Stone sawing 1.25
Traction ..... .75
Brass molding 2.00

Delaware, N. J.—**Molding fine** 2.00
Molding coarse 1.90
Brass Molding 2.15

Dresden, O.—Molding coarse ..... 1.50@1.75
Brass molding 1.75

Dunbar, Pa.—Traction, damp 2.00

Dundee, O.—Glass, core, sand blast, traction 2.50
Molding fine, brass molding (plus 75c for winter loading) 2.00
Molding coarse (plus 75c for winter loading) 1.75

Eau Claire, Wis.—Core 1.25
Sand blast ..... 2.50@3.75
Traction sand ..... .40

Falls Creek, Pa.—Molding, fine and coarse 1.75
Sand blast 3.00
Traction 1.75

Franklin, Pa.—Core ..... 1.00@1.75
Furnace lining 2.25
Molding fine 2.00
Molding coarse 1.75
Brass molding 2.00

Greenville, Ill.—Molding coarse ..... 1.20@1.40

Joliet, Ill.—Milled, dried and screened No. 2 coarse molding sand and open hearth loam and looting clay ..... .75@1.25

Kansas City, Mo.—Missouri River core ..... .80

Kasota, Minn.—Molding coarse and fine, stone sawing (pit run) 1.75

Klondike, Pacific and Gray Summit, Mo.—Molding fine and core ..... 1.75@2.00

Mapleton, Pa.—Glass sand, core, furnace lining, molding fine and coarse; dry, 2.50; damp 2.00

Massillon, O.—Traction, molding fine and coarse, furnace lining, core 2.25

Michigan City, Ind.—Core, traction ..... .30@ .40

Mineral Ridge, Ohio—Core ..... 1.75@2.00
Furnace lining, molding fine and coarse, roofing, sand blast, stone sawing and traction, brass molding 1.75

Montoursville, Pa.—Core ..... 1.25@1.50
Traction ..... 1.00@1.25
Brass molding ..... .40

New Lexington, O.—Molding fine 2.00
Molding coarse 1.75

Oregon, Ill.—Core, furnace lining, molding fine and coarse, traction ..... .75
Brass molding ..... .75
Sand blast 3.00

Ottawa, Ill.—Core, molding coarse (crude silica sand) ..... .60@ .75
Furnace lining ..... .70@ .85

Ottawa, Minn.—All crude silica sand ..... .75@1.25

Pelzer, S. C.—Glass sand (carload lots only) ..... .70

Rockwood, Mich.—Core, damp 2.00
Roofing 2.75
Sand blast 3.75

Miscellaneous Sands

(Continued)

Round Top, Md.—Glass sand ..... 1.75@2.00
Core, furnace lining 1.45
Traction 1.60

(All per 2000 lbs.)

San Francisco, Cal.—Glass and roofing ..... 3.00@3.50
Core, molding fine and brass ..... 2.30@2.60
Furnace lining and molding coarse ..... 3.60@4.25
Coarse core sand ..... 3.60@4.25
Sand blast 3.75
Stone sawing and traction 2.30

Thayers, Pa.—Core 1.75
Furnace lining 1.25
Molding fine and coarse 1.25
Traction 1.75

Utica, Ill.—Core ..... .75@1.00
Furnace lining 1.00
Molding fine and coarse ..... .60
Sand blast 2.50
Stone sawing 1.00
Traction and brass molding ..... 1.00@1.25

Utica, Pa.—Core ..... 1.25@2.25
Molding fine and coarse, traction, brass molding 2.00

Warwick, O.—Core, furnace lining, molding fine and coarse (damp, 1.75) dry 2.00
Traction (dry) 2.00

Zanesville, Ohio—Brass molding and molding fine ..... 1.35@1.75
Molding coarse ..... 1.35@1.50

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Crude Talc 3.50
Ground talc (20-50 mesh), bags 10.00
Cubes 50.00
Blanks, per lb. ..... .07

Chatsworth, Ga.—Crude talc ..... 8.00@10.00
Ground talc (150-200 mesh), bags 12.50
Pencils and steel workers' crayons, per gross ..... 1.50@ 2.00

Chester, Vt.—Ground talc (150-200 mesh), including bags ..... 8.25@10.00

Emeryville, N. Y.—150-200 mesh; bags 14.75

Glendale, Calif.—Ground talc (150-200-mesh ..... 16.00@30.00
(Bags extra)

Ground Talc (50-300 mesh) ..... 13.50@15.50
200 mesh) ..... 13.50@14.50

Hailesboro, N. Y.—Ground talc (150-250 mesh), bags 18.00

Henry, Va.—Crude talc (lump mine run), per 2000-lb. ton ..... 2.75@3.50
Ground talc (20-50 mesh) 5.75
(150-200 mesh) bags ..... 8.75@11.50

Johnson, Vt.—Ground talc (20-50 mesh), bulk 7.50 (150-200 mesh) ..... 8.00@15.00
(Bags extra)
Ground talc (150-200 mesh), bulk ..... 10.00@15.00
(Bags extra)

Los Angeles, Calif.—Ground talc (200 Mesh) 20.00

Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags ..... 12.00@13.00

Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk ..... 8.50@10.00
(Bags extra)
Ground talc (150-200 mesh), bulk ..... 10.00@22.00
(Bags extra)

Vermont—Ground talc (20-50 mesh); bags ..... 7.50@10.00
Ground talc (150-200 mesh); bags ..... 9.00@16.00

Waterbury, Vt.—Ground talc (20-50 mesh), bulk 8.50
(Bags $1.00 extra)
Ground talc (150-200 mesh), bulk ..... 10.00@15.00
(Bags 1.00 extra)

Pencils and steel workers' crayons, per gross ..... 1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75% ..... 6.00@8.50
B.P.L. 65% 6.00

Gordonsburg, Tenn.—B.P.L. 68%@72% ..... 4.00@5.00

Tennessee—F. o. b. mines, long tons, unground Tenn. brown rock, 72% B. P. L. 7.00

Mt. Pleasant, Tenn.—Analysis, .70 B.P.L. (2000 lbs.) 7.00

Montpelier, Idaho—70% B.P.L.—Crude 4.75
Crushed 2-in. ring and dried 5.00

Paris, Idaho.—2,000 lb. mine run, B.P.L. 70% 4.00

Wales, Tenn.—B.P.L. 70% 7.75

Per 2000-lb. Ton

Barton, Fla.—Analysis, 50% to 65% B.P.L. ..... 3.50@6.00

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f.o.b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$ 9.30	$8.40	$8.10	$7.80
24x14	9.30	8.40	8.10	7.80
22x12	10.80	8.70	8.40	9.10
22x11	10.80	8.70	8.40	9.10
20x12	10.80	8.70	8.40	9.10
20x10	11.70	9.00	8.40	9.10
18x10	11.70	9.00	8.70	8.40
18x 9	11.70	9.00	8.70	8.40
16x10	11.70	8.40	8.70	8.40
16x 9	11.70	8.40	8.40	8.10
16x 8	11.70	8.40	8.40	8.10
18x12	11.10	8.40	8.40	8.10
16x12	11.10	8.70	8.40	8.10
14x10	11.10	8.70	8.40	8.10
14x 8	11.10	8.40	8.10	7.80
14x7 to 12x6	9.60	8.40	8.10	7.80
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$7.50	$7.20	$5.75
22x11	8.40	7.80	7.50	5.75
Other sizes	8.70	8.10	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.
Granulated slate per net ton f. o. b. quarries, Vermont and New York, 7.50

(Continued from preceding page)

Ground Rock

Centerville, Tenn.—B.P.L. 65%	6.00
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Morriston, Fla.—Analysis, 35% B.P.L.	12.00
Mt. Pleasant, Tenn.—B.P.L. 65 to 70%	5.00@6.50

Florida Soft Phosphate

Raw Land Pebble

Per Ton

Bartow and Norwills, Fla.—B.P.L. 50%, bulk	6.00@ 8.00
B.P.L. 78%, bulk	13.50
Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

Per Ton

Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Lakeland, Fla.—B.P.L. 60%	6.00
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	6.00@ 7.00

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	20.00	9.00@14.00
Granville, N. Y. — Red slate granules		7.50
Ingomar, Ohio	12.00@25.00	12.00@25.00
Lincoln, Neb. — Red, white, grey, in bags		30.00
Middlebrook, Mo.—Red granite; sacks	28.50@30.00	20.00@22.50
Milwaukee, Wis.		20.00@26.50
Phillipsb'g, N. J.—Green stucco dash		9.00@14.00
Piqua, O.—Marble	8.00@10.00	7.00@ 9.00
Poultney, Vt. — Roofing granules		3.75
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.	7.00@12.00	12.00
Wausau, Wis.	14.00@18.00	

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	20.00	25.00@32.00
Bellows Falls, Vt.	18.00	25.00
Birmingham, Ala.	18.00	32.00@49.00
Bridgeport, Conn.	31.00	32.00
Carpenterville, N. J.	16.00	35.00@65.00
Easton, Pa.	16.00	40.00@60.00
Eugene, Ore.	25.00	50.00
Rochester, N. Y.	21.00	
Friesland, Wis.	20.00	
Houston, Tex.		19.50
Lockport, N. Y.	16.00	
Omaha, Neb.	20.00	30.00@40.00
Piqua, O.	15.00	25.00
Phoenix, Ariz.	16.00	35.00@80.00
Portland, Ore. (Del'd)	21.00	30.00@60.00
Puyallup, Wash.	20.00	35.00@85.00
Rapid City, S. D.	18.00	25.00@40.00
St. Paul, Minn.	15.00	30.00@35.00
Salem, Ore.	25.00@30.00	35.00@75.00
Salt Lake City, Utah	18.00	35.00
Seattle, Wash.	18.00@22.00	35.00@75.00
Springfield, Ill.	18.00	20.00@25.00
Tampa, Fla.	15.00	25.00@65.00
Wauwatosa, Wis.	13.00@13.50	26.00@42.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Albany, Ga.	7.00
Barton, Wis.	8.50
Boston, Mass.	12.00@13.00
Brighton, N. Y.	14.75
Buffalo, N. Y.	16.50
Dayton, Ohio	13.50
El Paso, Texas	13.00
Gary, Ind.	11.50@12.00
Grand Rapids, Mich.	12.00
Lancaster, N. Y.	12.50
Michigan City, Ind.	10.00
Milwaukee, Wis.	12.00@12.50
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Portage, Wis.	15.00
Redfield, Mass.	15.00
Rives Junction, Mich.	10.00
Saginaw, Mich.	11.50
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
F. o. b. cars	13.00
Washington, D. C.	13.50
Winnipeg, Can.	14.00

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton Finishing	Common
Atlanta, Ga.	19.00	16.00
Baltimore, Md.	15.00	13.00
Boston, Mass.	23.00	20.00
Cincinnati, Ohio	19.60	14.50
Chicago, Ill.	18.00	
Dallas, Tex.	25.00	
Denver, Colo.	30.00	
Detroit, Mich.	15.25	13.25
Fort Dodge, Ia.	19.70	17.00
Grand Rapids, Mich.	15.65	
Los Angeles, Calif.	30.00	30.00
Minneapolis, Minn.	29.00	22.00
Montreal, Que.	21.00	21.00
New Orleans, La.		17.25
New York, N. Y.	16.99	
St. Louis, Mo.	23.20	20.00
San Francisco, Calif.	22.00	18.00
Seattle, Wash.	27.00	

	Lump per 180-lb. Barrel (net) Finishing	Common
Atlanta, Ga.	2.00	1.50
Baltimore, Md.		12.00†
Boston, Mass.	3.35	3.10
Cincinnati, Ohio		12.25
Chicago, Ill.		1.40
Denver, Colo.		2.95
Detroit, Mich.	11.50†	10.50†
Los Angeles, Calif.	3.00*	3.00*
Minneapolis, Minn.	1.70	1.40
New Orleans, La.		1.75
New York, N. Y.		3.69*
St. Louis, Mo.		.70*
San Francisco, Calif.		1.90
Seattle, Wash.	3.25	2.75

*280-bbl. (net). †Per ton.

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga. (bags)	3.45
Boston, Mass.	2.61
Cedar Rapids, Ia.	2.21
Cincinnati, Ohio	2.35
Cleveland, Ohio	2.26
Chicago, Ill.	1.97
Dallas, Tex.	2.25
Davenport, Ia.	2.14
Denver, Colo.	2.69
Detroit, Mich.	2.17
Duluth, Minn.	1.94
Indianapolis, Ind.	2.21
Kansas City, Mo.	2.30
Los Angeles, Calif.	3.20
Milwaukee, Wis.	2.18
Minneapolis, Minn.	2.24
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.80
New York, N. Y. (includes bags) (10c per bbl. discount in 10 days)	2.40
Pittsburgh, Pa.	2.02
Portland, Ore.	3.05
St. Louis, Mo.	2.10
San Francisco, Calif.	2.63
St. Paul, Minn.	2.24
Toledo, Ohio	2.20
Seattle, Wash.	2.94

NOTE—Add 40c per bbl. for bags.

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White‖ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lbs. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lbs. Per M Sq. Ft.	Wallboard, ⅜x32 or 48", Lengths 6'-10', 1850 lbs. Per M Sq. Ft.
Douglas, Ariz.	.....	.....	6.00	13.00	.....	10.50@12.00	.....	.....	.....	11.50@13.50	.....	.....	.....
Fort Dodge, Ia.	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	.....	.....	.....
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	.....	.....
Grand Rapids, Mich.	3.00	4.00	6.00	9.00	9.00	9.00	.....	.....	27.75	21.00	19.38	20.00	30.00
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Winnipeg, Man.	5.50	5.50	7.00	15.00	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond Plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; ‖White Moulding 50c per ton additional; ||Bulk: (a) Includes sacks.

News of All the Industry

Incorporations

The Huron Sand and Gravel Co. has been incorporated in Marysville, Mich., with a capital stock of $15,000.

The Wayne County Sand and Gravel Co. has been incorporated in Detroit, Mich., for $25,000 with offices at 521 Stevens Building.

The Michigan Gravel and Gypsum Co. has been incorporated in Grand Rapids, Mich., with a capital of $10,000.

The Globe Granite Co., St. Cloud, Minn., has been incorporated for $60,000 by J. S., P. J. and W. L. Warner to quarry marble, granite, sandstone, etc.

The Sano Marble and Tile Co. has been incorporated in Minneapolis, Minn., with a capital stock of $25,000 by G. F. Edwards, B. A. Jeub and P. J. Majerous.

The Valley Rock and Gravel Co. has been incorporated in Brownsville, Tex., with a capital of $10,000, by W. H. Mason, Jr., A. A. Ririe and H. L. Montanden.

The Ohio Rock Products Co., Vincent, Ohio, has been incorporated for $1,000 by T. F. Hayes, G. E. Hayes, C. H. Danford, V. E. Metcalf and Lillian M. Stephans.

The Victoria Gray Marble Co. has been incorporated in Knoxville, Tenn., with a capital of $150,000 by C. H. Ross, H. O. Healy and W. H. Dickson to develop a marble quarry.

The Clifdale Quarry and Manufacturing Co. has been incorporated in Brickleys, Mo., with a capital of $25,000 by T. A. Carron, E. R. Rombauer and M. J. Whyte.

The Urbana-Greenville Gravel Co., Greenville, Ohio, has been incorporated for $200,000 by F. D. Coppock, H. R. Brown, Guy C. Baker, Joe F. Coppock and C. E. Patty.

The Mayo Island Sand Co. has been incorporated in Richmond, Va., with a capital stock of $10,000. William M. Reynolds is president and F. T. Sutton is secretary.

The Independent River Sand Co., Moundsville, W. Va., has been incorporated for $250,000 by J. R. Dorsey, E. Frey, Stephan Steranchak, R. E. Heck, all of Pittsburgh, and H. L. Allshouse of Irwin, Pa.

The Gainesville Lime Rock Co. has been incorporated in Gainesville, Fla., with a capital stock of $100,000 by O. H. Harper, president, Chiefland, Fla., and J. W. McDowell, secretary and treasurer, Gainesville.

Sand and Gravel

The Moraine Gravel Co., Blenbeulah, Wis., has purchased another gravel pit at Hunting, and will probably have it in operation by June 1.

The Bryn Mar Sand and Gravel Co., Minneapolis, Minn., has been incorporated for $50,000 by J. G. Moorhead, F. M. Groves and C. W. Abraham.

The Silica Sand Co.'s plant near Barberton, Ohio, was practically destroyed by a fire recently, causing a loss of $25,000. Cause of blaze is unknown.

The Badger Sand and Gravel Co., New Butler, Wis., has increased its capital from $10,000 to $25,000. Joseph Kane is president and Hugo Schattschneider is secretary.

The Independence Sand and Gravel Co., Dallas, Ore., has increased its working force and installed a new motor-driven elevator and a crusher. The company has a contract to supply gravel for 50 miles of highway.

The Knoxville Sand and Lime Co., Knoxville, Tenn., formerly the Knoxville Sand and Transportation Co., has been purchased by Milton McDermott and T. H. Johnston, who have reorganized the company on a much larger scale. The plant will have a capacity of 750 bbl. per day of lime and 500 tons of sand. The sand plant will operate a steamer, a dredge and 10 barges. The lime plant is modern in every respect.

Dealers

The Concrete Supply Co., Decatur, Ill., has been incorporated for $10,000 by P. B. Suncox, G. Poole and R. A. Miller to deal in and manufacture building material and concrete products.

The William F. Erdmann Co., North Milwaukee, Wis., has been incorporated for $24,000 by William F. Erdmann, Elizabeth Erdmann and F. J. Schmidt to deal in stone and other building materials.

The U. S. Fiber Lath and Plaster Board Co., Chicago, has been incorporated for $10,000 by C. E. Guyton, N. E. Snyder and William R. T. Ewen to manufacture and deal in fiber lath, plaster board, etc.

Fooshkill & Hirsch, Inc., Woodhaven, L. I., N. Y., have been incorporated with a capital of $25,000 to manufacture cement blocks, terra cotta, ceramic ware, etc. Incorporators are William Hirsch, Sarah Hirsch and Louis Fooshkill.

The Independent Service Corp., Milwaukee, Wis., has been incorporated for $25,000 to deal in brick, concrete and clay products and machinery for making these products. L. J. Stroble, G. F. Grundmann and R. L. Griggs are the incorporators.

The General Construction Co., Wisconsin Rapids, Wis., has been incorporated for $10,000 to engage in general construction and contracting business and furnish building materials and supplies, by G. R. Hoffman, L. E. Fichaux and M. E. Engle.

Quarries

The Double Eagle Mine, Valley, Wash., has installed a cable and cars on the tramway to bring crude magnesite from the quarry to the kilns, to be prepared for use in stucco work.

The J. Hoadley & Sons Stone Co., Bloomingington, Ind., has been awarded the contract to provide stone for the new $200,000 building for the School of Commerce and Finance of Indiana University. The contract amounts to approximately $30,000.

The Leavenworth Quarry Co., Leavenworth, Kans., recently organized, will begin operation on its property at Pilot Knob immediately. New machinery has been purchased and the crushing plant has been entirely overhauled. The company is now in position to supply all local demands for crushed rock.

Indianapolis, Ind.—With the revival of construction work throughout the country, the cut stone business is reflecting the activity, according to R. J. Ittenbach, president of the G. Ittenbach Cut Stone Co. "We are working absolutely at capacity at the present time," he said. "I believe that soon we will be forced to put on night shifts in an effort to supply the demand. The use of Indiana limestone is increasing and is in almost 80 per cent of the construction work in the country."

Cement

Victoria, B. C.—The British Columbia Cement Co., has a contract to ship 1500 tons of cement to Manchuria, China.

The Lehigh Portland Cement Co., Allentown, Pa., announces an increase in its employees' wages, the exact amount of which has not been designated.

Nazareth, Pa.—At the annual meeting of the stockholders of the Phoenix Portland Cement Co. the following directors were elected: J. L. Walker, L. C. Morton, C. L. McKenzie, J. C. Parsons and C. P. Haubert

The Canada Cement Co., Ltd., Montreal, plans the reconstruction of its plant at Lakefield, Que.

The Hochelaja Cement Co., Ltd., Montreal, proposes to erect a plant at Montreal East with a capacity of 2500 bbl. per day.

Hudson Valley Portland Cement Corp. first mortgage, 15-year sinking fund gold bonds, yielding about 8.30 per cent, are being offered at 97½ and interest, in denominationss of $1000, $500 and $100, with interest payable June 15 and December 15. The American Trust Co., New York, is the trustee.

The Hanover Cement and Stone Co., Ltd., Hanover, Ont., is issuing $340,000 mortgage bonds, being part of a total issue of $600,000. The original company, the Hanover Portland Cement Co., Ltd., operated a marl plant from 1901 to 1920. To enable the necessary financing to change from a marl to a limestone process the Hanover Cement and Stone Co. has been organized and is now operating. The change will permit manufacture at lower cost and will increase the output 300 per cent. The company owns plant, clay beds and hydro-electric power plants at Hanover and quarry properties and equipment at Walkerton. The directors are J. S. Knechtel, W. J. George, J. Y. Ormsby, A. Longwell, Toronto; H. Gruetzer, Hanover, former president Hanover Portland Cement Co., and D. D. McTavish. The authorized capital is $1,500,000.

Personal

Edward P. Reiter of the Consumers Co., Chicago, has been elected president of the Chicago Association of Credit Men at that body's recent annual meeting.

Hon. A. P. Sandles, secretary of the National Crushed Stone Association, Ohio Macadam Association and National Agricultural Association, attended the Memorial Day Services at Luckey, Ohio, and was on the program to address the assembly.

C. O. Sandstrom, W. W. Wheeler and **R. C. Clark** have opened offices in the Interstate building, Kansas City, Mo., and will engage in the practice of engineering and construction under the name of Industrial Service Co. Particular attention will be given to the design, construction and operation of cement, lime, stone crushing and other plants. The service will include valuations and reports and the design and installation of machinery and mechanical equipment.

Trade Literature

"Built to Endure"—The Koehring Co., Milwaukee, Wis., is paying a tribute to concrete in the booklet under this title solely by describing and picturing a few of the wonders wrought in concrete. This compilation has been done in an attractive, human way. Space is given to the ancient history of this material—from slave-driven manual labor to the present type of machinery; the big place it occupies in modern typography and engraving.

Steel Belt Conveyors—Sandvik Steel, Inc., Sandviken, Sweden, with American offices at the Woolworth building, New York City, announces its new 26-page booklet on steel belt conveyors. It contains information as to the application of this type of belt in solving conveyor problems, its efficiency, economy, etc. Harry Carlson, of this company, says that there is very little literature on this type of belting, although for the past 12 years the Sandvik has made 1300 installations up to 800-ft. center distances. Only a limited supply of this booklet is available.

Excavating Equipment—Pawling & Harnischconstruction. This book is a fine example of feger Co., Milwaukee, Wis., have just issued their Bulletin 57-X. It describes and illustrates in its 36 pages the P. & H. gas-driven "8 in 1" excavators of various sizes and types, including full-circle swing gas shovels, draglines, grab-bucket and material-handling cranes, and the other rigs to be used with this machine—the skimmer scoop and pile-driving rig and such accessories as may be used with these cranes as a backfilling scraper bucket, hook and sling chains and electromagnet. This bulletin supersedes No. 56-X.

The Metal and Thermit Corp., New York, have removed its Pittsburgh branch offices to 801-807 Hillsboro street, Corliss Station, Pittsburgh, Pa.

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Please send check with your order. These ads must be paid for in advance of insertion.

RETURN TUBULAR LOCOMOTIVE BOILERS WATER TUBE SCOTCH MARINE

A LARGE STOCK OF HIGH-GRADE BOILERS OF PRACTICALLY ALL SIZES, TYPES AND MAKES, TAKEN OVER FROM DU PONT CHEMICAL COMPANY'S AND OTHER PLANTS WITH PRODUCTION RECORDS—RECONDITIONED, OFFERED SUBJECT TO ANY INSPECTION, AVAILABLE *NOW!*

"SAVE TIME AND MONEY ON YOUR POWER INSTALLATION—LET DAVIS FURNISH THE BOILERS"

LONG DISTANCE TELEPHONE RANDOLPH 2232

J. F. DAVIS

1122-1123-1124 Harris Trust Building CHICAGO, ILL.

FOR SALE

2—8x110′ Rotary Kilns
6—5x6x7x110′ Rotary Kilns
3—6x16′ Tube Mills, Silax Lined
9—5x21′ Tube Mills, Steel Lining
6—250 H.P. Oil City Water Tube Boilers
1—Coal Dryer
1—Rock Dryer
8—Krupp Ball Mills
1—No. 8 Austin Crusher
4—Engines, 200 to 500 H.P.
8—33″ Fuller Mills
8—42″ Fuller Mills

Shafting, Pulleys, Bearings, and Elevator Equipment, All First-Class Operating Condition

50 Acres of Land and Five Buildings, Stone and Steel Construction. Located at Stockertown, Pa.

ENGINEERING SALES CO., Nashville, Tenn. OLLIE LAWRENCE, Stockertown, Pa.

FOR RENT AND SALE

20—12-yd. Western dump cars, std. gauge.
50—60,000-lb. capacity flat and box cars.
1—Western standard gauge spreader.
1—Osgood 18 revolving shovel, traction wheels, No. 794, ¾-yd. bucket, used 8 months.
1—Class 14 Bucyrus dragline on caterpillars, 70-ft. boom, 2-yd. bucket, used 6 months.
1—Marion 76 steam shovel, No. 3503, std. gauge, weight 110 tons, used 10 months.
1—No. 2 Brownhoist 4-wheel gas. crane, std. gauge, 40-ft. boom, ½-yd. bucket, new 1921.
64—NEW 18-in. I-beams, 80 lbs. per ft., 40 ft. long, not drilled.
1—NEW Lakewood concrete chuting system.
6—NEW wood-burning locomotive-stacks.

LOCOMOTIVES

1—50-ton 18x24-in. six-wheel switcher.
1—40-ton 17x24-in. four-wheel switcher.
2—NEW 24-ton six-wheel Porters, separate tender, 36-in. gauge.
2—18, 14 and 10-ton Vulcans, 36-in. gauge.

INDUSTRIAL EQUIPMENT CO.
McCormick Building Chicago, Ill.

SECOND-HAND EQUIPMENT

No. 7½ Kennedy gyratory crusher.
No. 5 Gates gyratory crusher.
9x18 jaw crusher.
50-ft. bucket elevator and 3x16 revolving screen.
Keystone Excavator (ditcher and skimmer scoops).
65-ton Bucyrus shovel 2½ on railroad trucks.
Thew full revolving traction shovel, ⅝ yd.
Byers auto crane, 32 ft. steel boom, ¾ yd. bucket.
⅝-yd. caterpillar drag line, 40-ft. boom.
15-ton full revolving locomotive crane.
Switcher, 6-wheel.
½-yd. Pioneer cableway bucket with hanger.
15 cu. ft. Hayward orange peel bucket.
Sturdevant rolls, 20x14 with feeder.
Holt tractor and Port Huron trailers.
2 miles 24″ gauge portable track, 24″ gauge.
30 steel cars, 24″ gauge, 1½ yd.
2 locomotives, gasoline, 3-ton, 24″ gauge.
Bargain prices. Can give terms.

LOCK BOX 205, CROWN POINT, INDIANA

FOR SALE

2000′—16-lb. Track, 30″ gauge.
12—1-yd. U Dump Cars, 30″ gauge.
5—Turntables.
6—End Dump Quarry Cars.
2—Gable Side Dump Cars.
New and Relay Rails.

IVANHOE EQUIPMENT CO.
1130 Ivanhoe Road Cleveland, Ohio

FOR SALE

Roll Hammer Crusher No. 20; manufactured by Kennedy Van Saun, equipped with two sets of manganese grid screens in perfect order. New shaft, spiders, hammers and grids put in this month.

Kapailo Mfg. Co., Inc., 103 Park Ave., New York City

FOR SALE

1—42-ton Standard gauge Baldwin Mogul, 160-lb. Steam.
1—36-ton Standard gauge Baldwin Mogul, 11′ wheel base.
2—50-ton Standard gauge Brooks 6-wheel switchers, 160-lb. steam..
1—50-ton Standard gauge Shay geared locomotive.
1—42-ton Standard gauge Shay geared locomotive.
2—23-ton brand new 36″ gauge Porter 6-wheel switchers, separate tenders.
2—18-ton O & S 8-wheel two-line locomotive cranes.
1—14-B Bucyrus Steam Shovel, mounted on traction wheels.

Birmingham Rail & Locomotive Co.
Birmingham, Ala.

WANTED

Three-fourth yard Caterpillar steam shovel —any standard make. Would like to rent with option to purchase. Address

P. O. Box 1202, Jacksonville, Florida

IMMEDIATE DELIVERY

SEND US YOUR STEAM SHOVEL INQUIRIES

66x86 in. TRAYLOR JAW CRUSHER.
No. 18K GATES CRUSHER.
50-75 HP. Single Drum Hoists, 25 Cy. Motors.
25-40-50 HP. D.D. Hoists, 60 Cy., 220-440 V., 3 Ph.
Nos. 3-5-6-7½ & 8K CRUSHERS.
6 and 12 ton Gasoline Locomotives.
10x12 in. Steam Hoist, 3 Drum.
2—DISC CRUSHERS, 36″ SYMONS.
2—60 ft. BARBER-GREEN 18″ BELT CONVEYORS.
100 TON 2½ YD. ELEC. SHOVEL.
50 to 5000 ft. Steam, Belt & Elec. Compressors.
JAW and ROLL CRUSHERS.
10-15 & 20 Ton Locomotive Cranes.
13x30 in., 9x14 in. and Other Jaw Crushers.
24x54 McLANAHAN ROLL CRUSHER.
Send us your inquiries for Steam Engine, Centrifugal Pumps, Quarry & Cont. Equip., Etc.

ROSS POWER EQUIP. CO., Indianapolis, Ind.

FOR SALE

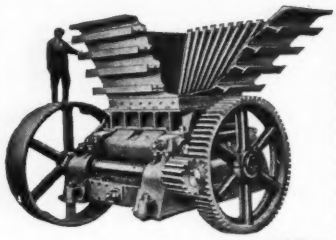
Equipment in Excellent Condition

1—Monighan All Steel, Steam Drag-Line Excavator, 60-ft. Boom.
1—Marion 45 Ton Steam Shovel (Railroad Type).
4—Steel Dump Cars, Standard Gauge, 100,000 lbs. capacity.
2—Wooden Dump Cars, Standard Gauge, 80,000 lbs. capacity.

Selling the above equipment because we have installed Hydraulic Dredge.

INTERSTATE SAND & GRAVEL CO.
123 West Madison St., Chicago

"PENNSYLVANIA" Single Roll Crusher



The New Series of "Pennsylvania" Single Roll Crushers take steam-shovel feed of limestone, cement rock, gypsum and similar materials, — wet and sticky, — without feeder, and make maximum reduction in one operation. All parts readily accessible. Maintenance cost lower per ton than for any other type. Massive construction — Reliable Safety Devices — Convenient adjustment. Capacities 5 to 450 tons hourly.

Put Your Reduction Problems Up to Us

PENNSYLVANIA CRUSHER COMPANY

Stephen Girard Bldg., Philadelphia

New York
Pittsburgh

FLORY HOISTS

CABLEWAYS
DREDGING MACHINERY

A Flory Hoist for Every Purpose

CATALOG ON REQUEST

S. FLORY MFG. CO.
BANGOR, PENNSYLVANIA

New York, 95 Liberty St.; Pittsburgh, House Bldg.; Birmingham, Chas. T. Lehman; Chicago, Monadnock Block; Hartford, K. B. Noble Co.; Huntington, W. Va., Banks Supply Co.

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Wanted—Experienced Operator

for New Electric Hydraulic Dredge, 12-inch Amsco Pump, at Libertyville, Ill. Apply

Interstate Sand & Gravel Co.
123 West Madison St. Chicago

POSITION WANTED

Superintendent with 20 years' experience in sand and gravel plants. Can install and overhaul all sand and gravel machinery. Experienced in long distance pumping. Want to connect with responsible firm. Available now. Can furnish first class references. Address

Box 1567, care of Rock Products
542 South Dearborn Street Chicago, Ill.

FOR SALE

TWO BYERS AUTOCRANES — 30 foot boom, 1 yard Orton & Steinbrenner buckets, full enclosed cabs; good condition; can be seen working.

Crerar, Clinch & Co. Coal Yard
Foot of East South Water St., Chicago

"DREDGING PUMP" FOR SALE

One 10" Morris Sand and Gravel dredging pump, 10" suction, 10" discharge, direct connected to double 9x9 engines.
One Scotch Marine Boiler, 200 H. P.

M. A. CALLAHAN
"The Sand Man"
Schofield Bldg. Cleveland, Ohio

Take advantage of the Opportunity offered in the Used Equipment Department to dispose of the equipment that you no longer need.

FOR SALE

Stone crushing plant complete, in Elk County, Pennsylvania, with well developed glass sand stone quarry. Farm of 300 acres with buildings, fruit trees and timber in connection. Present owner unable to give proper attention. Price reasonable; terms to suit. Address

Box 1566, Care Rock Products
542 South Dearborn Street, Chicago, Ill.

BURNERS WANTED

For cement burning. Must be familiar with oil burning. Write

Monolith Portland Cement Company
Monolith, Calif.

New—RAILS—Relaying

All sections on hand for quick shipment Reasonable prices quoted. Our stock is very complete.

M. K. FRANK
Frick Building Pittsburgh, Pa

LOCOMOTIVE CRANE

15-ton Brown Hoist Locomotive Crane, D. D. D. C., 4-wheel, full revolving 45-ft. boom, $2250.

Jeffrey pulverizer, hammer type, 10-ton per hour capacity.

D. B. Straley, Crown Point, Ind.

SUPERINTENDENT

With twenty years' experience in construction and operation of large crushing plants, quarry operations using steam shovels and modern equipment; also cement mill and pulverizing experience, will be open for engagement after July 1st. Address

Box 1564, Care Rock Products
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SUPERINTENDENT

of 20 years' experience in the stone and quarrying business desires position. Has thorough knowledge of all kinds of stone working machinery, steam shovels, heavy blasting erection and construction of same. Address

Box 1568, Care of Rock Products
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QUARRYING BUSINESS FOR SALE

Located Central Pennsylvania. Now in operation. Favorable freight rates. Low royalty on stone.

Winston & Co., Muncy, Pa.

BUCYRUS SHOVEL

For Sale—One 45-C Bucyrus Steam Shovel with 1¾ yard dipper mounted on Standard R. R. Trucks. But little used and in first-class operating condition. Immediate delivery.

Bodine Stone Co., Buffalo Station, Va.

QUARRY EQUIPMENT

4—20 yd. Steel Underframe Side Dump Cars.
3—16 yd. Steel Underframe Western Dump Cars.
10—1½ yd. Western Dump Cars.
2—10x16 Davenport 36 in. ga. Saddle Tanks.
1—11x16 American 36 in. ga. Saddle Tank.
1—9x14 Porter 4 ft. 8½ in. ga. Saddle Tank.
1—¾ yd. Thew "O" Traction Shovel.

Walter A. Zelnicker Supply Co., St. Louis

THE McMYLER

THERE is power built into each machine, a ruggedness that can be depended on to stretch out into months and years of flawless service.

Try out the Type "J" Locomotive Crane and its operation will convince

THE McMYLER INTERSTATE CO.
Cleveland, Ohio

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New Orleans, La., 444 Maison Blanche Annex
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The Morgan Producer Gas Machine

is the highest class gas producer built in the U. S. and is advertised in this journal the second issue of each month.

Morgan Construction Company
Worcester, Mass.

Pittsburgh Office: 704 Arrott Bldg. Telephone Court 1381

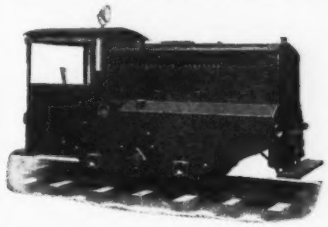
One Billion Dollars

This is approximately the amount of money that will be spent on good roads during the coming year.

Is your plant in proper condition so that you may get your share of this tremendous business? Now is the time to make the necessary changes. We can give you a real engineering service, a service without prejudice, a service that considers only the particular needs of the producer. Quick action will be profitable.

James N. Hatch, C. E., M. E.
Member A. S. C. E.
CONSULTING ENGINEER
717 Monadnock Bldg. Chicago, Ill.

WHERE THERE IS REAL WORK TO BE DONE YOU WILL FIND A "MINSTER"



Equip right—make the first cost the last cost.

No other Locomotive surpasses the "Minster" for service and lasting economy.

Model "F" in 6-, 7- and 8-Ton Sizes

The Industrial Equipment Co.
310-316 Ohio Street
Minster, Ohio

Eastern and Export Dept.
The Herbert Crapster Co., Inc.
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PULVERIZED LIMESTONE
WASHED SAND & GRAVEL
AGRICULTURAL LIMESTONE

Complete machinery equipment and detail plans of structures and arrangement of machinery for plants of the above nature.

S. G. ARTINGSTALL, JR., M. E.
First National Bank Bldg. Chicago, Ill.

WE DESIGN AND EQUIP COMPLETE PLANTS

for the manufacture of gypsum products, such as wall plaster, moulding plaster, wall board products, gypsum block products, also mixing plants.

We are prepared to furnish complete machinery-equipment and design and furnish plans for the installation. Consult our Engineering Department. Forty years' experience in designing of wall plaster machinery and plants.

The J. B. Ehrsam & Sons Mfg. Co.
Engineers, Machinists and Founders
Enterprise, Kansas
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ROBERT W. HUNT & CO.

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Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

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F. L. SMIDTH & CO.

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CEMENT MANUFACTURING PLANTS
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GRANULATING AND PULVERIZING MACHINES FOR ALL MATERIALS
FLINT PEBBLES—SILEX LINING
THE LENIX BELT DRIVE

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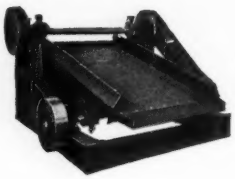

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FAMOUS DERRICK IRONS, FITTINGS AND ERECTORS' TOOLS

FULL CIRCLE CRANES. "EQUIPMENT THAT LASTS." TIMBER & STEEL DERRICKS

LET US SOLVE YOUR MATERIAL HANDLING PROBLEMS.

All Types of Steel and Timber DERRICKS

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Electric Motors and Generators

for all requirements of the Rock Products Industry

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AUTOMATIC
ECONOMICAL
DEPENDABLE

Prompt Installations

SEND FOR US

INTERSTATE EQUIPMENT CORPORATION

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Albany

Registered U. S. Patent Office

For Shafting and Machinery

The trade mark identifies the real Albany Grease—a mark known and respected around the world since 1868, for fair dealing, a quality product and an unexcelled service.

Your dealer stocks it.

Adam Cook's Sons

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Grease

BACON-FARREL ORE & ROCK CRUSHING-WORLD KNOWN ROLLS-CRUSHERS

EARLE C. BACON, INC. ENGINEERS
26 CORTLANDT ST., NEW YORK

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WE MAKE CARS FOR COAL, ORE, STONE, SAND, GRAVEL, CLAY AND BRICK. DRYER AND INDUSTRIAL CARS. THE WATT FACTORY IS THE LARGEST IN THE WORLD DEVOTED ALONE TO CAR BUILDING OVER 50 YEARS' EXPERIENCE

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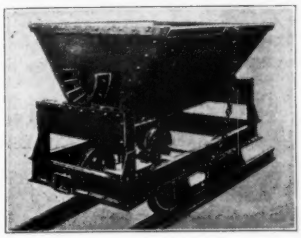
We Look Into the Earth

By using Diamond Core Drills. We drill for Limestone, Gypsum, Talc, Fire Clay, Coal and all minerals.

We are fully equipped for testing foundations for bridges, dams, buildings, and all work of a similar character.

PENNSYLVANIA DRILLING CO.
Drilling Contractors
Pittsburgh, Pa.

Strongest and Cheapest Quarry Car



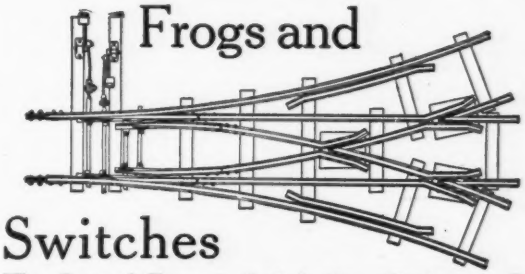
on the market. That is what quarry men tell us who are using our Standard 72" Side Dump Quarry Car for 24" standard gauge track.

Equipped with Steel Pin Rockers and Brass Journals that can be replaced instantly.

Write for Complete Details and Prices.

GEHRET BROTHERS
Manufacturers of Structural Steel, Ornamental Iron Work, Quarry Cars, etc.
Bridgeport, Montgomery County, Pa.

Frogs and Switches



The Central Frog & Switch Co., Cincinnati, O.

Frogs, Switches, Crossings, Switch Stands, Rails, Angle Bars, Fishplates, Throws, Rail Braces, Tie Plates, Portable Track, Etc., Etc.

SCREENS
OF ALL KINDS

Chicago Perforating Co.
2445 West 24th Place
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Byers Auto Crane

All steel construction. Any mounting. Any power. All standard attachments. 800 in use today proves Byers popularity in the smaller crane field.

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PERFORATED SCREENS
and Steel Plate Work

W. TOEPFER & SONS COMPANY
Milwaukee Wisconsin

SAUERMAN DRAGLINE CABLEWAY EXCAVATORS

dig, convey, elevate and dump in one operation

Cost data furnished by prominent gravel producers who are using Sauerman equipment backs up our claim that sand and gravel can be excavated and conveyed from pit to plant by one of our drag-line cableway excavators at a lower cost per ton than by using any other equipment or combination of equipment.

Write for Catalog No. 7

Sauerman Bros.
1140 Monadnock Bldg.
Chicago
Also Mfrs. of Power Scrapers

AMERICAN GASOLINE LOCOMOTIVE

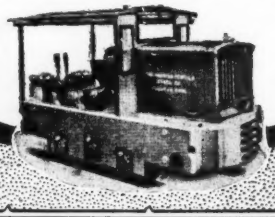
An Ideal Machine to Produce Continuous Haulage at Minimum Cost

If you have haulage work to do, let the Gas-O-Motive do it. The engine is so simple in construction, so ruggedly built, that it can go through the severest service—service that would put other apparatus out of commission—and come out ready for the next job. "Gas-O-Motives" rarely visit the repair shop.

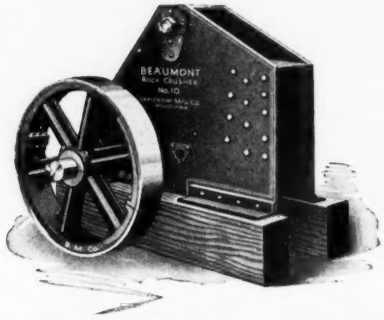
If you have a haulage problem send us your name and address.

"Over a 2,000 foot grade, ranging from 5 to 7 percent, the American Gasoline Locomotive hauls two cars of 2½ yard capacity each, and does it constantly. It works perfectly." Okmulgee Brick Co., Okmulgee, Okla.

THE HADFIELD-PENFIELD STEEL CO.
George G. Stein, Mgr. Gasoline Locomotive Sales Dept.
404 Hippodrome Bldg. CLEVELAND, OHIO



BEAUMONT ROCK CRUSHERS



Built for great strength where hard crushing, portability and efficiency are required

Size	Jaw Opening	Tons Per Hour	H.P. Required	Weight
9	9″x15″	12-18	15	8,500
10	10″x20″	16-24	18	12,300
12	12″x26″	25-35	25	19,900

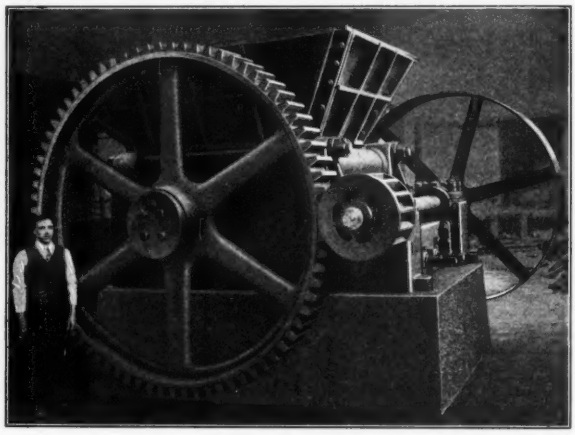
Immediate Shipment can be made on above size Crushers.

Beaumont Screens
Beaumont Elevators

Send for prices and full information on our equipment.

Manufactured by

H. J. KALTENTHALER
236 Cherry Street Philadelphia, Pa.

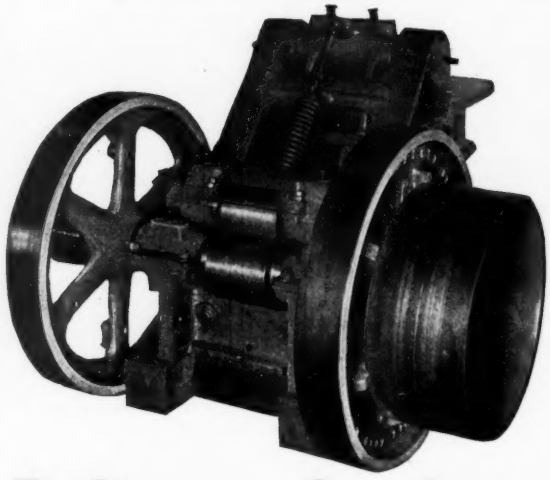


If you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher, you would now be running only the McLanahan Crushers.

After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

McLanahan-Stone Machine Co.
Hollidaysburg, Pa.
Screens, Elevators, Conveyors, Rock Washers, Etc.



Reliance Crushers

IN ALL SIZES FOR EITHER PORTABLE PLANTS FOR ROAD BUILDING OR STATIONARY QUARRY INSTALLATIONS.

BUILT FOR LONG, HARD SERVICE—WILL SAVE YOU MONEY IN THE LONG RUN

Let us quote you prices

Universal Road Machinery Co., Kingston, N. Y.
Branches in all principal cities in U. S. and Canada
MANUFACTURERS OF THE FAMOUS RELIANCE LINE OF ROAD BUILDING AND QUARRY EQUIPMENT

Austin Gyratory Crushers

Stationary and Portable Types

The Gyratory type of crusher has numerous features of proven worth.

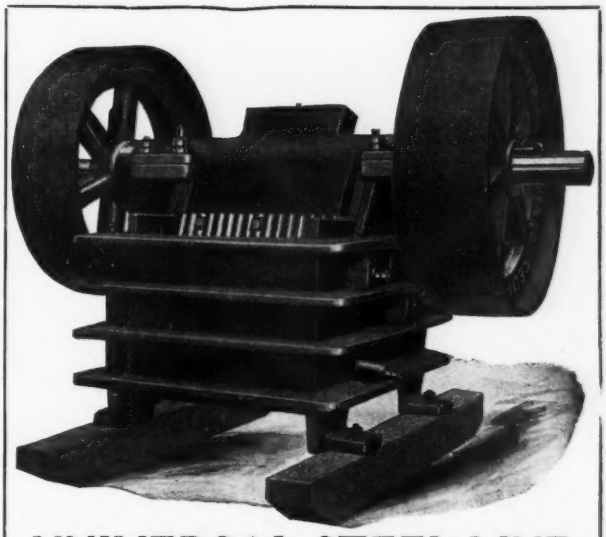
The Austin has features not found in any other Gyratory Crusher.

Catalog 29-T illustrates and describes the entire line of Austin Crushers, Screens, Elevators, Cars, Hoists, etc., and gives plans for many particularly successful complete crushing and screening plants.

Write for your copy today

AUSTIN MANUFACTURING CO.

New York Chicago San Francisco



UNIVERSAL STEEL LINE

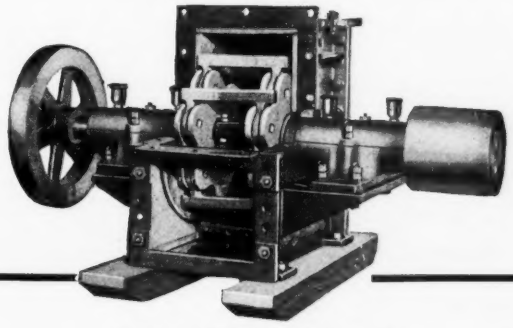
THE PERFECT GRAVEL AND REJECTION CRUSHER

Sizes up to 8"x36". Capacities 20 to 200 tons daily. Crushes to ¾" and finer if desired. Has no superior for FINE CRUSHING and UNIFORMITY of product.

STRONG LIGHT DURABLE ECONOMICAL

UNIVERSAL CRUSHER CO.

225 Third Street Cedar Rapids, Iowa, U. S. A.



Interior of K-B Pulverizer showing Manganese Steel Lining Plates

Does the material you're handling pulverize your Pulverizer?

All parts of the K-B Pulverizer that come in contact with the material to be crushed are made of Manganese Steel—the best material obtainable for the duty required

Only Steel will stand the stress

K-B is built ALL steel

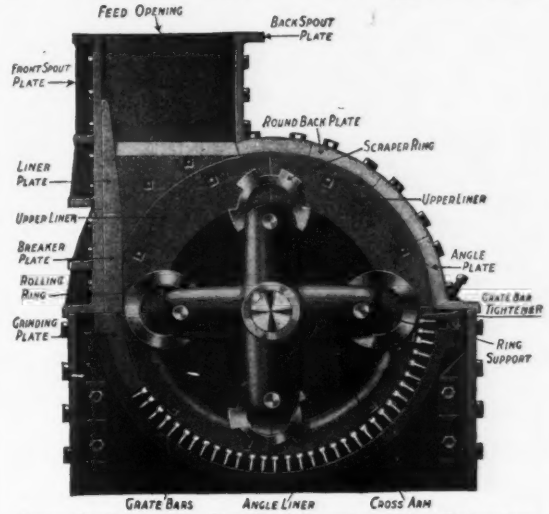
Send for Catalog

K-B PULVERIZER

K-B Pulverizer Company, Inc.

92 Lafayette Street New York

Greater Tonnage Lower Operating Cost



Cross Section of the Standard American Ring Pulverizer

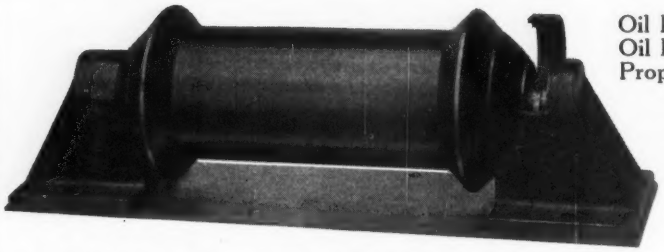
The flexibility of the Rolling Rings prevents break downs or damage to the Pulverizer caused by foreign material passing into the machine.

Write us for particulars

AMERICAN PULVERIZER COMPANY

Gen. Office and Factory: 18th and Austin Sts.

ST. LOUIS, MO.



Oil Reservoirs
Oil Rings Insure
Proper Lubrication

Double Bearing
Durable
Frictionless
Sheaves

ROLLERS AND SHEAVES BUILT FOR SERVICE.
LOW ORIGINAL COST — INSTALLATION — UPKEEP
Send for Descriptive Catalog

CHICAGO MINING SHEAVE AND ROLLER CO.
2320 CHICAGO AVENUE
CHICAGO, ILL.

THE GAYCO-EMERICK
CENTRIFUGAL AIR SEPARATOR

The first radical improvement in fine separation in a century

A principle which makes obsolete all other separating methods

60 mesh to 350 mesh

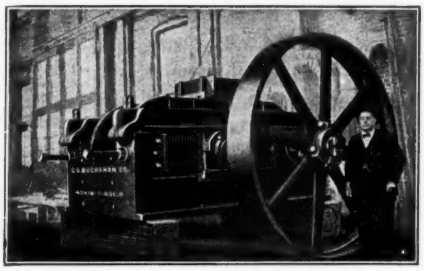
For limestone, coal, clay, silica, talc, graphite and all other dry ground materials

Increases B. P. L. content of Phosphate Rock

Write for Bulletin C

RUBERT M. GAY COMPANY
114 Liberty St. New York, N. Y.

BUCHANAN CRUSHING ROLLS



Type "C" Buchanan Box Bed Crushing Rolls for Heavy Duty
Bulletin No. 13

Years of manufacturing experience, combined with an intimate knowledge of the conditions under which such machines operate, assures the purchaser of Buchanan Equipment machines of remarkable durability.

COMPLETE CRUSHING PLANTS

C. G. BUCHANAN CO., Inc.
Cedar and West Streets NEW YORK CITY

STURTEVANT "ONE-MAN ONE-MINUTE" "OPEN-DOOR" MACHINERY

Crushing, Grinding, Pulverizing,
Screening, Sizing, Air Separating, Mixing,
Weighing, Elevating and Conveying Machinery
Complete Units -:- -:- Engineering Service

STURTEVANT MILL CO., HARRISON SQUARE BOSTON, MASS.

Speed! Hauling is a racing game — a race against time, delays, accidents, pay-rolls, schedules. Don't discount the admitted greater speed of the Pierce-Arrow.

Pierce-Arrow
TRUCKS

The Pierce-Arrow Motor Car Company
Buffalo, New York

2-ton $3200 3½-ton $4350 5-ton $4850 fully equipped

MORE GRAVEL; less cost

Even the smallest ERIE often gives an output of 500 tons a day, or even more under favorable conditions.

P. Cogger, Lowell, Mass., owner of the 13-ton ERIE shown above, writes:

"I would not have believed that we could do the work that this 'A' ERIE actually handles. It has given 50 per cent more than I expected. Besides, we have dug frozen sand and rock, without a thing going wrong with the machine."

Whether you need an output of 200 tons a day or 1,000 tons, you will be interested in a bulletin that shows just what ERIE Shovels can do for you. Write for Bulletin P-16.

Branch Offices:
BOSTON NEW YORK
PHILADELPHIA
PITTSBURGH CHICAGO
Representatives throughout the U. S. A.

Erie Steam Shovel Co., Erie, Pa., U. S. A.
Builders of ERIE Steam Shovels and Locomotive Cranes

ERIE Revolving Shovels

OSGOOD
STEAM SHOVELS

REDUCED YARDAGE COST

is the problem OSGOOD Revolving Type Shovels are solving every day and doing it easy due to their Rigid and Compact Construction and ease of handling.

Horizontal Hoisting Engines, Vertical Submerged Tube Type Boilers, All-steel Caterpillar mountings, Quick Acting Power Steering Devices and Double Drive Shipper Shaft are only a few Features of construction but are IMPORTANT TO YOU.

Write us your requirements and let us show you why you will do better with an OSGOOD.

Revolving and Railroad Type Shovels ¾ to 6 cu. yds.

Write for Copy of Catalog R

THE OSGOOD COMPANY, Marion, Ohio, U.S.A.

INTERNATIONAL BARRELS

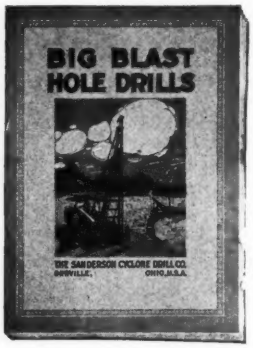
are without equal for quality, strength and durability

They are the best containers used in the Lime, Cement and Plaster Trades.

Our several branch shops permit quick deliveries of these QUALITY BARRELS to your plant, wherever it is located.

Samples and prices sent on request

International Cooperage Co., Inc.
Niagara Falls, N. Y.



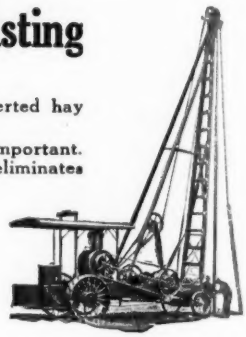
Analyze Your Drilling and Blasting

Our new Blast Hole Catalog B-46 (96 pages) will help you.

The day of poking a hole down with a rivet header or a converted hay bailer is past.

Drilling, being the first step in stone production, is the most important. One cent or one-half cent per ton cost saved in this operation often eliminates competition.

With Cyclone No. 14 Drills on the job and Cyclone Service in reserve, your drilling and blasting troubles fade—and your costs will be right.



THE SANDERSON-CYCLONE DRILL CO.
Orrville, Ohio
Eastern and Export Office, 30 Church St., New York

The Clyde Lime Hydrator Performance Counts

The Clyde was first in the field, and through dependable and economical performance is still first choice of lime operators.

The Clyde Hydrator produces big capacities of lime at only three-fifths the cost of any other hydrator on the market.

The Clyde not only produces over 90% of the hydrate of America, but makes the best quality of finishing lime from either high calcium or magnesium.

Simple, easiest to operate and most economical in cost of installing, maintaining, and operating.

Send for Catalog

H. MISCAMPBELL
Patentee and Sole Manufacturer
DULUTH - - MINNESOTA

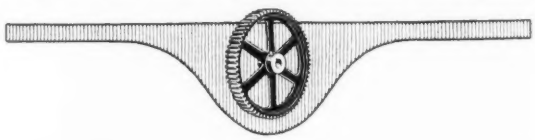
GEARS

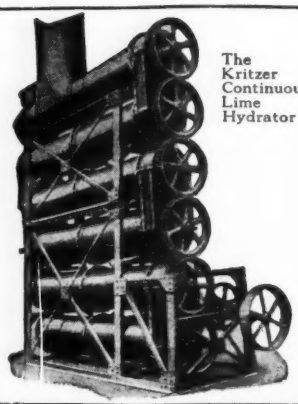
SMOOTH running; correct in design, accurate and true to pitch, Caldwell gears are bound to please you. We make all types—machine-molded, cut tooth, mortise gears, worm gears, etc. Learn more about Caldwell-Link-Belt Service.

Let us figure with you next time you are in the market.

H. W. CALDWELL & SON CO. LINK-BELT COMPANY, OWNER
Dallas, Texas, 709 Main Street—Chicago, 17th Street and Western Ave.—New York, Woolworth Bldg.

CALDWELL





The Kritzer Continuous Lime Hydrator

HYDRATE

Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

THE KRITZER COMPANY
503 South Jefferson Street CHICAGO, ILL.

Perforated Steel Screens

The success of any house supplying repair and renewal parts depends on furnishing what is needed quickly and correctly, and of satisfactory quality.

Sixteen years in the Perforated Metal field have given us the experience, equipment and technical knowledge and three hundred tons or more of Steel Plates and Sheets enable us to fill rush orders promptly.

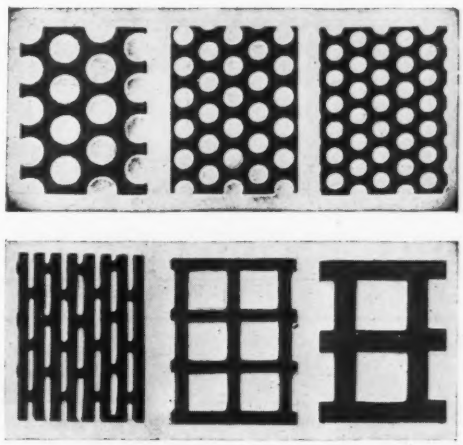
Try us with your next order.

Cross Engineering Company, Offices and Works, Carbondale, Pa.

Perforated Metal Screens
FOR
Stone, Gravel, Sand, Etc.

ELEVATOR BUCKETS
PLAIN AND PERFORATED
General Sheet and Light Structural Work
"Light and Heavy Steel Plate Construction"
HENDRICK MFG. CO.
CARBONDALE, PA.
New York Office, 30 Church Street
Pittsburgh Office, 544 Union Arcade Bldg.
Hazleton, Pennsylvania, Office, 705 Markle Bank Bldg.

Perforated Steel Screens



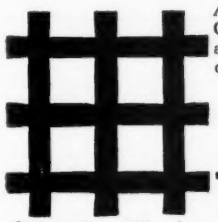
For Screening Stone, Gravel, Sand and Cement

All sizes and shapes of holes in metal of proper thicknesses to give the best screening results.

Sheets furnished flat or rolled to shape for revolving screens.

THE HARRINGTON & KING PERFORATING CO.
638 N. Union Ave., Chicago, Ill.
NEW YORK OFFICE: 114 Liberty St.

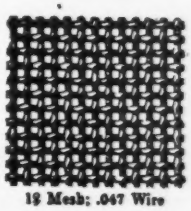
"CLEVELAND" DOUBLE CRIMPED WIRE CLOTH



2½ mesh; .105 wire

A uniform fineness is assured by the use of "Cleveland" Double Crimped Wire Cloth, making it unequalled for the screening of Sand, Gravel, Crushed Stone and Cement. "Service" is the definite policy of this organization, and through every phase of manufacture this end is constantly before us.

A large stock always on hand. However, any special mesh will be manufactured to suit requirements. PRICES RIGHT



18 Mesh; .047 Wire

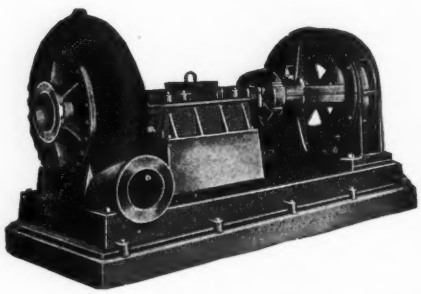
THE CLEVELAND WIRE CLOTH AND MANUFACTURING COMPANY
3573 East 78th Street
Cleveland, Ohio

Wallace Stone Co.

This is one of three VULCAN Locomotives owned by the Wallace Stone Co. Workmanship that gives complete satisfaction is always far more satisfactory to both customer and manufacturer than is any short-sighted policy of price only. It is the ideal of the Vulcan Iron Works to produce a product that will always make friends.

VULCAN IRON WORKS
Established 1849
1753 Main Street, Wilkes-Barre, Pa.

VULCAN INDUSTRIAL LOCOMOTIVES
and leading Industrial Concerns



Heavy Service Dredging Pump

Where conditions are too severe for our standard sand pump, the above type is recommended.

It is built in sizes from 4" up, arranged for belt, motor, or engine drive.

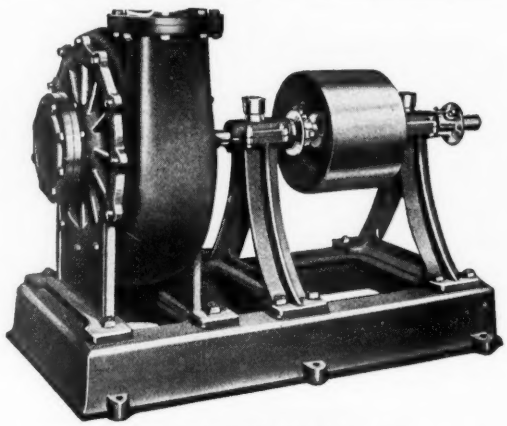
MORRIS MACHINE WORKS
50 Genesee St. Baldwinsville, N. Y.

39 Cortlandt St., New York City
Real Estate Trust Bldg., Philadelphia, Pa.
217 N. Jefferson St., Chicago, Ill.
Penobscot Bldg., Detroit, Mich.

Bulletin No. 19-B fully describes our complete line of sand and dredging pumps. Have you your copy?

MORRIS

Since the Civil War Builders of Centrifugal Pumps, Hydraulic Dredges, and Steam Engines



The LIGHTNING Sand Gravel and Dredging Pump

The durability and integrity of Lightning Sand Pumps, stamp them as the ideal pump for sand companies and contractors.

They are easy to operate, easy to adjust, and easy to replace parts. Shell and Runner made of Semi-steel.

Write for prices and complete information

Kansas City Hay Press & Tractor Co.
Kansas City, Mo.

FACING CONCRETE WORK

Middlebury Terrazzo for the facing of all Concrete Products and Stucco Buildings gives the appearance of solid marble with a material saving in price.

This aggregate is made from Middlebury White and Creme Statuary Marbles, making a beautiful and everlasting face, giving the building a distinctive appearance, a richness of finish that can be obtained by no other facing.

This material is furnished, carefully graded to size, in either dust, No. 1, 2 or 3. Write for samples and prices

Middlebury Marble Company
BRANDON, VERMONT

EVER-GREEN and EVER-RED Slate Granules

Ever-Green and Ever-Red Slate Granules, used in making slate surfaced roofing, slate flour as a filler in paints, mechanical rubber goods, linoleum, window shades, plastic roofing, roofing cement, and asphalt roads, can be used with telling effect

For the Facing of Concrete Blocks, Bricks or Stucco

The beauty, style and finish of a building covered with this material adds appreciably to its value.

It can be delivered carefully graded to size.

Write for samples and prices
VERMONT MILLING PRODUCTS CORP.
POULTNEY, VERMONT

METRO NITE

for Stucco-

Stucco Buildings, Concrete Blocks or Bricks faced with Metro-Nite are beautiful, artistic and everlasting.

Metro-Nite White is of a crystalline character, really a siliceous dolomite. It is extremely hard, sharp and cleanly graded, making a bright, sparkling face.

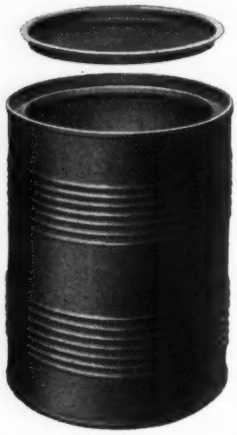
Free samples mailed on request.

Two colors—White and Green.

The Metro-Nite Co.
333 Hartford Ave., Milwaukee, Wis.

DMC
Reg. U. S. Pat. Off.

Send it Safely—Ship in Steel



No. 12 Light Shipping Steel Barrel

Serving the Lime Field

For one year we have been offering the lime and cement field the services of the Draper Steel Barrel. Results have so far justified our efforts that we feel impelled to say to every producer that the advent of our steel barrel in this field has marked an epoch in the shipping of rock products.

If you are not using Draper Steel Barrel Service
get in touch with our sales department

"What the Shipper Puts In
the Customer Takes Out"

THE DRAPER MFG. CO.

8906 Crane Ave. Cleveland, Ohio

District Sales Offices:

New Orleans, La.—203 Pan-American Bldg.; E. J. Putzell, Dist. Sales Mgr.
New York—110 William St.; C. B. Peters Co., Inc., Eastern Sales Representative
Chicago, Ill.—128 N. Wells St.; Amco Sales Corporation.
San Francisco, Cal.—16 California St.; The Hale Co.

Our No. 9 Catalogue Just Fits Your Pocket

PLAMONDON
TRANSMISSION MACHINERY

Dust Proof Friction Clutches—

The continuous friction surfaces of the Plamondon Disc Type Friction Clutch, consists of but three parts, with all the simple mechanism for adjusting and operating on the outside in plain view.

No part is affected by centrifugal action—they can be run at high speed with safety, and without loss of efficiency. The adjustment for wear is made entirely by means of one adjusting collar, which gives a uniform pressure on all parts of the friction surfaces. These surfaces are absolutely dust proof, and are universally used by leading cement mills.

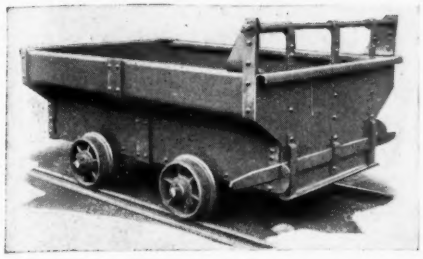
Our products also consist of Heavy Gearing, Cut Gears and Machine Molded Gears of all kinds—Shafting, Pulleys, Hangers, Couplings, Collars, Pillow Blocks, Worm-Wheels, Fly-Wheels, Rope Sheaves, Grey Iron and Semisteel Castings by analysis.

We Solicit Inquiries

A. PLAMONDON MANUFACTURING CO.

Engineers, Founders, and Machinists
Established 1859 — Incorporated 1877
Works and Main Office: 5301 South Western Boulevard, Chicago, Illinois
EMERGENCY ORDERS RECEIVE SPECIAL ATTENTION

EASTON *Quarry Car*



STANDARD TYPE No. 5476

The low overall height, only 3 ft. 6 in., makes hand loading easy. Strongly built of ¼ in. plate to withstand shovel loading. Automatically opening swing door. Self oiling or roller-in-hub bearings-optional on 14 in. wheels.

In these advertisements, which appear from time to time, are illustrations and brief descriptions of certain standard types of Eastern Quarry Cars. You are invited to correspond with us in regard to your exact requirements as we build a complete line. To assist you in determining the sort of car best suited to your needs, we suggest that you send for the 32-page Bulletin, "Quarry Car Practice," which we will gladly forward on request.

Coal Mine Type of Body. Capacity for 48 in. track, 66 cu. ft.; for 36 in. track, 50 cu. ft.

EASTON INDUSTRIAL CARS

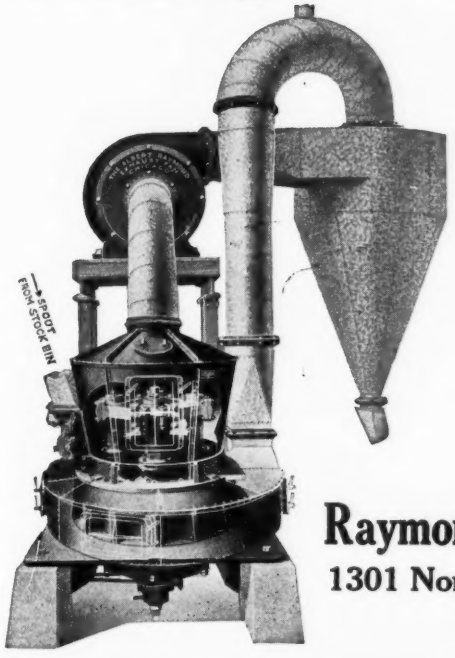
Main Office and Works: Easton, Penn.

New York Philadelphia Pittsburgh St. Louis
Norfolk Savannah Birmingham
Salt Lake City Los Angeles

EASTON CAR & CONS'T'N CO

2158-E

Cheaper Powdered Coal



Cement Plants that are looking to lower their costs in the Coal House and increase production on their Kilns will find Raymond Roller Mills the solution of their problem.

One plant formerly operating 20 Kilns is now getting the same production from 19 with the use of Raymond Mill Coal.

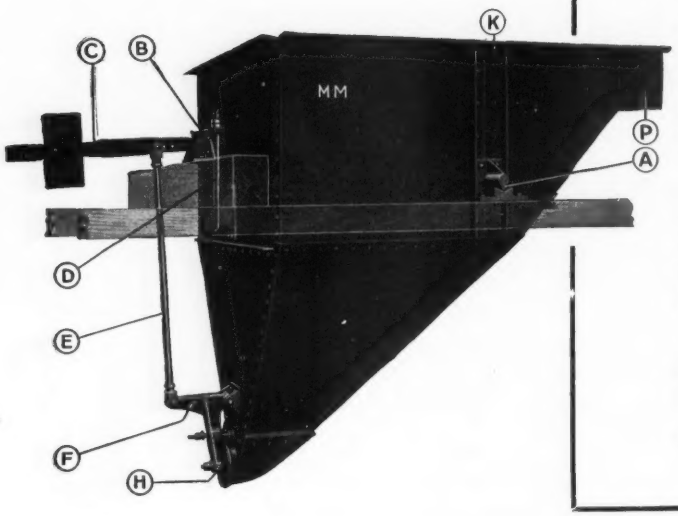
Why not get full details on your problem today?

Raymond Bros. Impact Pulverizer Company

1301 North Branch Street Chicago, Ill.

Western Office: 201 Boston Bldg., Denver, Colo.
Eastern Office: 50 Church St., New York City

Telsmith Sand Tank



The Telsmith Sand Tank and its counterweight-arm are both carried on knife-edge bearings, with a wide range of adjustment. As the tank pivots one way, the valve plate pivots in the OPPOSITE DIRECTION, giving ample discharge area with a short, snappy valve action. The swing of both members is limited by an adjustable stop, so that the sand is discharged in SMALL QUANTITIES but at FREQUENT INTERVALS, assuring a deep sand-bed and a dry product.

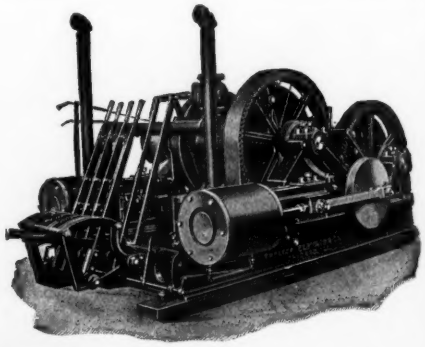
This tank works automatically and reliably, with only ordinary inspection service. Here's a chance to cut your pay-roll by one man. Send for bulletin No. S-T-11.

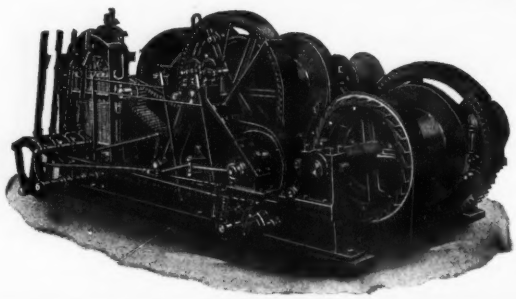
SMITH ENGINEERING WORKS 3188 LOCUST ST.
MILWAUKEE, WISCONSIN

Thomas Hoists

Steam and Electric
Single and Two Speed Types

For
Dragline Cableways
Drag Scrapers
Derricks
Bucket Operation
Car Haulage





Designed and built to give dependable service for every requirement of the Sand, Gravel and Stone Producer.

Thomas Elevator Co.

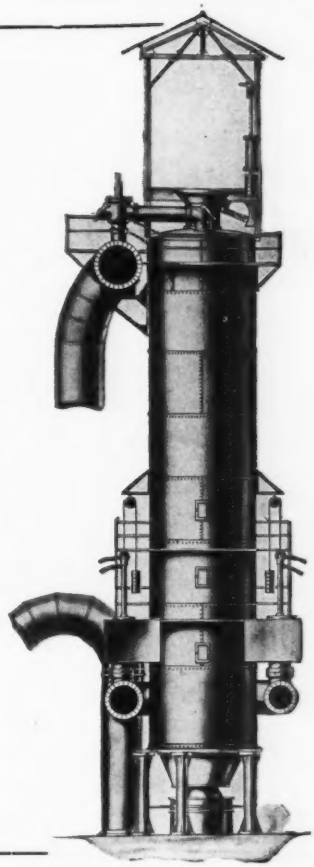
27 South Hoyne Avenue **Chicago, Ill.**

Continuous Discharge—Gas Fired

LIME KILNS

The wastefulness of efficiency of any lime burning apparatus is determined by the amount of fuel per ton of lime produced.

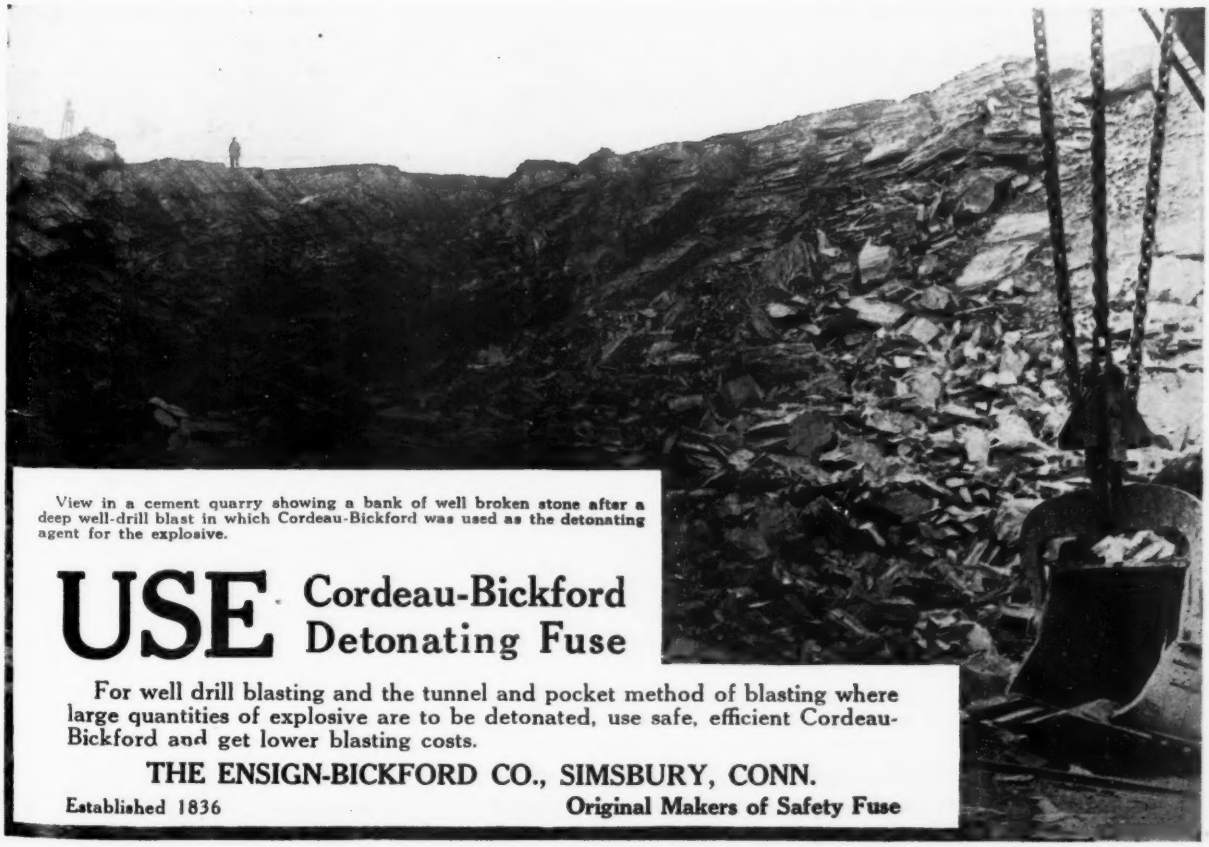
Our Kilns are not an experiment, but have successfully met the test of years of actual service. The design is the work of our Consulting Mechanical and Chemical Engineer, who has had many years of practical operative experience. They embody a number of labor saving devices, and are designed to secure maximum production with minimum fuel consumption; their record in this respect should interest every lime producer in the country.



Glamorgan Pipe & Foundry Company

Lynchburg, Va., U. S. A.

Using the Nationally Famous Virginia Foundry Irons



View in a cement quarry showing a bank of well broken stone after a deep well-drill blast in which Cordeau-Bickford was used as the detonating agent for the explosive.

USE Cordeau-Bickford Detonating Fuse

For well drill blasting and the tunnel and pocket method of blasting where large quantities of explosive are to be detonated, use safe, efficient Cordeau-Bickford and get lower blasting costs.

THE ENSIGN-BICKFORD CO., SIMSBURY, CONN.

Established 1836 Original Makers of Safety Fuse

AMSCO

MISSABE DIPPER
At the Hawkeye Quarry

Economy is never established by first cost

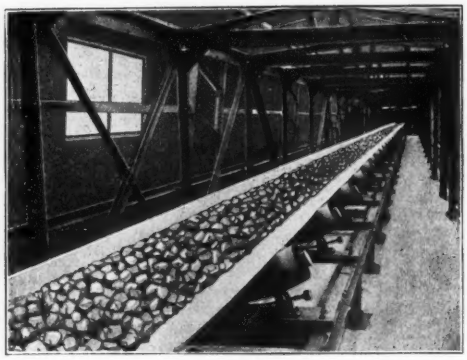
It is earned only by long continued service of the product.

AMSCO Missabe Dippers have long since proven their true economy — especially where the service is severe.

This has been the experience of the Hawkeye Portland Cement Company of Des Moines, Iowa, as well as the many other users in all parts of the country. There are two AMSCO Missabe Dippers working in the Hawkeye quarries.

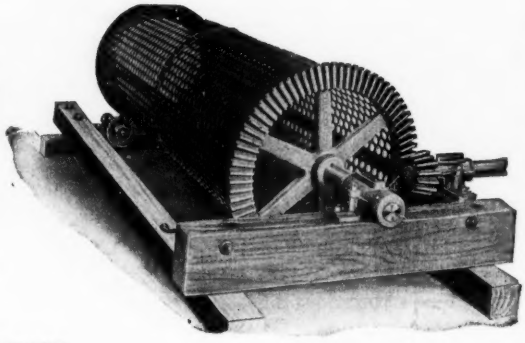
AMERICAN MANGANESE STEEL COMPANY
General Sales Offices, 398 E. 14th St., Chicago Heights, Ill.
Foundries, Chicago Heights, Ill.—Newcastle, Del.—Oakland, Cal.

CONVEYING MACHINERY
FOR HANDLING
Cement, Coal, Fertilizer, Gravel, Gypsum, Lime, Phosphate, Sand, Crushed Stone, etc.
WILL INCREASE THE OUTPUT AND CUT YOUR EXPENSES



WELLER MADE CHICAGO

Inquiries and Orders Appreciated



WE DESIGN AND MAKE

Apron Conveyors	Spiral Conveyors	Steel Storage Bins	Screens
Belt Conveyors	Bucket Elevators	Bin Gates	Steel Chain
Drag Conveyors	Elevator Buckets	Car Pullers	Combination Chain
Chain Conveyors	Portable Elevators	Power Shovels	Sprockets, Gears, etc.

WELLER MFG. CO.

1820-1856 North Kostner Avenue **Chicago, Illinois**

SALES OFFICES

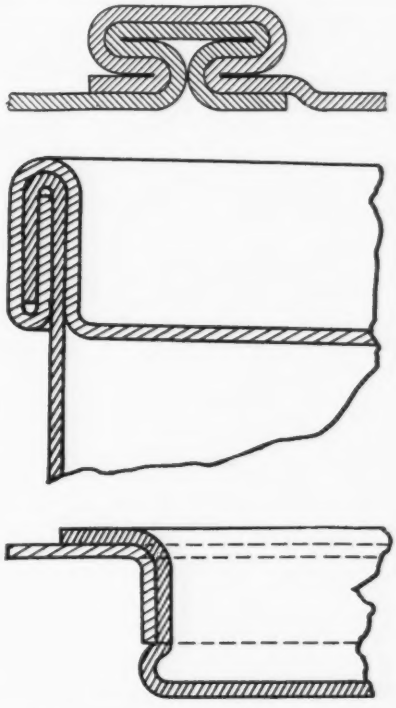
New York Boston Baltimore Pittsburgh Cleveland San Franciso Salt Lake City

They are Atmospheric Proof

As a lime producer it is obvious why your containers should be atmospheric proof. The trifling increase in cost to secure this great advantage must not be considered. The quality of your product when received by your customer is the proper business thought and if your output runs even as low as fifty barrels per day, you will find it economical and practical to manufacture steel barrels with our machinery.

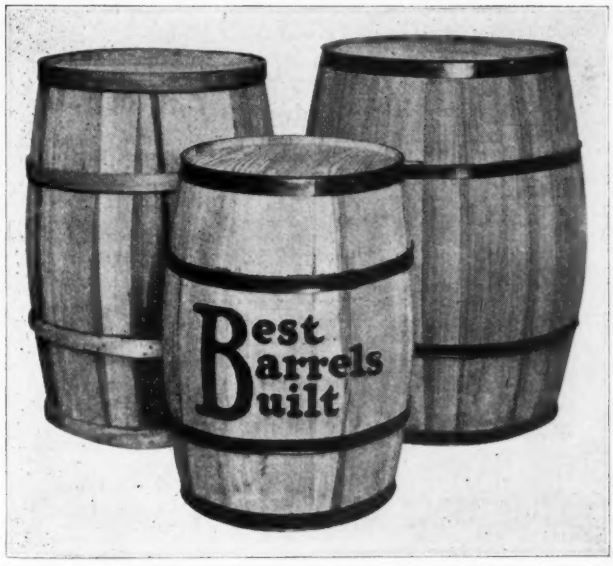
Our machinery will make steel barrels that are atmospheric proof without soldering or welding. See the cross section details—they tell you the story simply and positively.

THE D. H. STOLL CO., Inc.
BUFFALO, N. Y.



Three cross-section details—the side seam, the top and bottom seam, and the cap beading

The Wooden Barrel is Superior



THIS organization maintains for your convenience, fifty-one barrel plants and warehouses in all of the states east of the Mississippi River, and owns or controls the output of a large number of stave and heading mills located in the timber districts of the Southwest. Therefore we are prepared to deliver the "Best Barrels Built," made of tongued and grooved staves, glued heading, thoroughly Kiln dried, and bound with wood, wire or steel hoops to meet your requirements.

These barrels are practically indestructible, rat, vermin and moisture proof, and meet all the government and railroad requirements for the safe transportation of poisonous substances.

If you are in a hurry, we can supply you.

SANDUSKY COOPERAGE & LUMBER CO., Toledo, Ohio

Buyers' Directory
of the Rock Products Industry
Classified Directory of Advertisers in Rock Products

AERIAL TRAMWAYS
Interstate Equip. Co., New York, N. Y.

AIR COMPRESSORS
Bury Compressor Co., Erie, Pa.

AUTOMATIC WEIGHERS
Schaffer Eng. & Equipment Co., Pittsburgh, Pa.

BAGS AND BAG MACHINERY
Bates Valve Bag Co., Chicago, Ill.
Jaite Co., The, Jaite, Ohio.
Valve Bag Co. of America, Toledo, Ohio.

BARRELS—Lime
Draper Mfg. Co., The, Cleveland, Ohio.
International Cooperage Co., Niagara Falls, N. Y.
Sandusky Cooperage & Lbr. Co., Toledo, Ohio.

BARREL MAKING MACHINERY
The D. H. Stoll Co., Buffalo, N. Y.

BELTING
New York Belting & Packing Co., New York, N. Y.

BINS
Brown Hoisting Machinery Co., Cleveland, O.
Neff & Fry, Camden, Ohio (concrete stone)
Weller Mfg. Co., Chicago, Ill. (storage)

BIN GATES
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Bacon, Earle C., Inc., New York City.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

BLASTING SUPPLIES
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

BOILERS, WASTE, HEAT
Edge Moor Iron Co., Edge Moor, Del.
Freeman Mfg. Co., Racine, Wis.

BRICK MACHINERY
Besser Sales Co., Chicago, Ill.
Shope Brick Co., Portland, Ore.

BUCKETS—Elevator
Brown Hoisting Machinery Co., Cleveland, O.
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Jeffrey Mfg. Co., Columbus, O.
Orton & Steinbrenner, Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.

BUCKETS
Blaw-Knox Co., Pittsburgh, Pa.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Browning Co., Cleveland, Ohio.
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.
McMyler Interstate Co., Cleveland, Ohio.
Owen Bucket Co., Cleveland, Ohio.
Williams Co., G. H., Erie, Pa.

CABLEWAYS
Blaw-Knox Co., Pittsburgh, Pa.
S. Flory Mfg. Co., Bangor, Pa.
Interstate Equip. Co., New York, N. Y.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

CARS—Quarry and Industrial
Atlas Car & Mfg. Co., Cleveland, Ohio.
Easton Car & Constr. Co., Easton, Pa.
Gehret Bros., Bridgeport, Pa.
Kilbourne & Jacobs Mfg. Co., Columbus, O.
Watt Mining Car Wheel Co., Barnesville, Ohio

CAR DUMPERS
Car Dumper & Equip. Co., Chicago, Ill.

CAR PULLERS
Weller Mfg. Co., Chicago, Ill.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., N. Y. City.

CEMENT MILL REPAIRS
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

CLUTCHES
Webster Mfg. Co., Chicago, Ill.

COMPRESSORS, AIR
Ingersoll-Rand Co., N. Y. City.

CONVEYORS AND ELEVATORS
Caldwell, H. W., & Son Co., Chicago, Ill.
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.
Jeffrey Mfg. Co. The, Columbus, Ohio.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Robins Conveying Belt Co., New York City.
Stephens-Adamson Mfg. Co., Aurora, Ill.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago, Ill.

CRANES—Locomotive Gantry
Ball Engine Co., Erie, Pa.
Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Byers Mach. Co., The, Ravenna, Ohio.
Erie Steam Shovel Co., Erie, Pa.
McMyler-Interstate Co., Cleveland, Ohio.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., The, Marion, Ohio.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulverizer Co., St. Louis, Mo.
Austin Mfg. Co., Chicago, Ill.
Bacon, Earle C., Inc., New York, N. Y.
Bradley Pulverizer Co., Allentown, Pa.
Buchanan Co., Inc., C. G., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.
Chalmers & Williams, Chicago Heights, Ill.
Dixie Crusher Co., St. Louis, Mo.
Fuller-Lehigh Co., Fullerton, Pa.
Gruendler Pat. Crusher Co., St. Louis, Mo.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Kaltenthaler, H. J., Philadelphia, Pa.
K. B. Pulverizer Co., New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Munson Mill Machinery Co., Utica, N. Y.
New Holland Machine Co., New Holland, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Smidth & Co., F. L., New York, N. Y.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

CRUSHER REPAIRS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

CLUTCHES
Weller Mfg. Co., Chicago, Ill.

DERRICKS
Terry Mfg. Co., New York, N. Y.

DIPPER TEETH
American Manganese Steel Co., Chicago Heights, Ill.
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

DREDGING MACHINERY
S. Flory Mfg. Co., Bangor, Pa.
Keystone Driller Co., Beaver Falls, Pa.

DRILLS
The Loomis Machine Co., Tiffin, Ohio.
Sanderson Cyclone Drill Co., Orrville, Ohio.
Wood Drill Works, Paterson, N. J.

DRILLERS
Pennsylvania Drilling Co., Pittsburgh, Pa.

DRYERS
American Process Co., New York City.
The Reeves Bros. Co., Alliance, O.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

DUST COLLECTING SYSTEMS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DYNAMITE
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

ENGINES—Steam
Morris Mach. Works, Baldwinsville, N. Y.

ENGINES—Oil
Kahlenberg Bros. Co., Two Rivers, Wis.

ENGINEERS
Arnold & Weigel, Woodville, Ohio.
Artingstall, S. G., Jr., Chicago, Ill.
Austin Co., The, Cleveland, Ohio.
Bacon, Earle C., Inc., New York, N. Y.
Buckbee Co., J. C., Chicago, Ill.
Crow, Waller, Inc., Chicago, Ill.
Ehrsam & Sons Co., J. B., Enterprise, Kans.
Federal Bridge & Structural Steel Co., Waukesha, Wis.
Fuller Engineering Co., Allentown, Pa.
James N. Hatch, Chicago, Ill.
R. W. Hunt & Co., Chicago, Ill.
Randolph-Perkins Co., Chicago, Ill.
Smidth & Co., F. L., New York, N. Y.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Waller Crow, Inc., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.

EXCAVATORS
Ball Engine Co., Erie, Pa.
Brown Hoisting Machinery Co., Cleveland, O.
Erie Steam Shovel Co., Erie, Pa.
Keystone Driller Co., Beaver Falls, Pa.
Owen Bucket Co., Cleveland, Ohio.

EXCAVATORS—Dragline Cableway
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

FUSES
Ensign-Bickford Co., Simsbury, Conn.

GAS PRODUCERS
Morgan Construction Co., Worcester, Mass.

GEARS
Caldwell, H. W., & Son Co., Chicago, Ill.
Plamondon Mfg. Co., Chicago, Ill.

GENERATORS
Burke Electric Co., Erie, Pa.

(Continued on page 80)

Provide for the Future

When you buy a rod engine as heavy as your track and other conditions will permit, you have provided only for present demands.

When you buy a Shay Geared Locomotive of the same weight as your rod engine and tender, you are providing for the future. You have a more powerful locomotive, one that will handle a few more cars and do more work when output increases.

The surplus capacity of the Shay may save you from buying another engine later on.

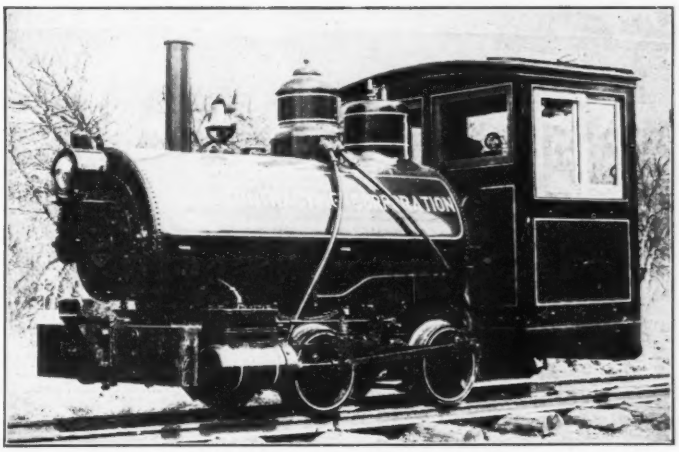
May we tell you more about the Shay and what it will do?

LIMA LOCOMOTIVE WORKS, Incorporated
17 East 42nd Street, New York Lima, Ohio

Where Speed in Building Locomotives is Imperative, We Can Fill Any Order

THIS industrial locomotive, now in operation at Shendaken, Ulster County, New York, weighs 13,900 pounds. The cylinders are 6x10 inches; driving wheels, diameter, 20 inches; gauge, 3 feet; tank capacity, 150 gallons; coal capacity, 600 pounds.

Our facilities for building motive power are unexcelled and we can meet any requirements.



Baldwin Four-Coupled Saddle Tank Locomotive built for the Ulen Contracting Corporation, and used in the Construction of the New York State Water Works. Ordered March 8, 1922. Shipped March 20, 1922

THE BALDWIN LOCOMOTIVE WORKS
PHILADELPHIA

771

Buyers' Directory
of the Rock Products Industry
Classified Directory of Advertisers in Rock Products

(Continued from page 78)

GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

GRATES
The Kramer Bros. Fdy. Co., Dayton, Ohio.

GRINDING MILLS
Munson Mill Machinery Co., Utica, N. Y.

HOISTS
Flory Mfg. Co., S., Bangor, Pa.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

HOSE—Water, Steam, Air Drill, Pneumatic Tool
Cincinnati Rubber Mfg. Co., Cincinnati, Ohio.
Ingersoll-Rand Co., New York City.
N. Y. Belting & Packing Co., New York, N. Y.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Kritzer Co., The, Chicago, Ill.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Toepfer & Sons Co., W., Milwaukee, Wis.

HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

LIME HANDLING EQUIPMENT
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

LIME KILNS
Arnold & Wiegel, Woodville, Ohio.
Glamorgan Pipe & Fdy. Co., Lynchburg, Va.
Vulcan Iron Works, Wilkes-Barre, Pa.

LOADERS AND UNLOADERS
Ball Engine Co., Erie, Pa.
Brown Hoisting Machinery Co., Cleveland, O.
Erie Steam Shovel Co., Erie, Pa.
Haiss Mfg. Co., The Geo., New York City.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Orton & Steinbrenner, Chicago, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Brookville Truck & Tractor Co., Brookville, Pa.
Fate-Root-Heath Co., Plymouth, Ohio.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Industrial Equip. Co., Minster, Ohio.
Jeffrey Mfg. Co., The, Columbus, Ohio.
Lima Locomotive Works, New York, N. Y.
Porter Co., H. K., Pittsburgh, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

MOTORS, ELECTRIC
Burke Electric Co., Erie, Pa.

MOTOR TRUCKS
Packard Motor Car Co., Detroit, Mich.
Pierce-Arrow Motor Car Co., Buffalo, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

PACKING—Sheet, Piston, Superheat, Hydraulic
Cincinnati Rubber & Mfg. Co., Cincinnati, Ohio.
N. Y. Belting & Packing Co., New York, N. Y.

PAINT AND COATINGS
Williams, C. K., & Co., Easton, Pa.

PERFORATED METALS
Chicago Perforating Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.
Ehrsam & Sons Co., J. B., Enterprise, Kans.

PORTABLE CONVEYORS
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.

POWDER
Atlas Powder Co., Wilmington, Del.
Du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.
Grasselli Powder Co., Cleveland, Ohio.
Hercules Powder Co., Wilmington, Del.

POWER TRANSMITTING MACHINERY
Caldwell, H. W., & Son Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.

PUMPS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Manganese Steel Co., Chicago Heights, Ill.
K. C. Hay Press & Tractor Co., Kansas City, Mo.
Morris Machine Works, Baldwinsville, N. Y.
Traylor Eng. & Mfg. Co., Allentown, Pa.

PULLEYS
Weller Mfg. Co., Chicago, Ill.

PULVERIZED FUEL EQUIPMENT
Fuller-Lehigh Co., Fullerton, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.

PUMP VALVES
N. Y. Belting & Packing Co., New York, N. Y.

QUARRY EQUIPMENT
Universal Road Mach. Co., Kingston, N. Y.

ROPE, WIRE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.

SCALES
Richardson Scale Co., Passaic, N. J.

SCRAPERS, DRAG
Green, L. P., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

SCREENS
Chicago Perf. Co., Chicago, Ill.
Cross Eng. Co., Carbondale, Pa.
Haiss Mfg. Co., Inc., Geo., N. Y. City, N. Y.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Tyler Co., The, W. S., Cleveland, Ohio.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SEPARATORS
Rubert M. Gay Co., New York City.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Tyler Co., The W. S., Cleveland, Ohio.

SEPARATORS, MAGNETIC
Buchanan Co., C. G., Inc., New York, N. Y.

SHEAVES
Chicago Mining Sheave & Roller Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SHOVELS—Steam and Electric
Ball Engine Co., Erie, Pa.
Brown Hoisting Machinery Co., Cleveland, O.
Bucyrus Co., South Milwaukee, Wis.
Erie Steam Shovel Co., Erie, Pa.
Orton & Steinbrenner Co., Chicago, Ill.
Osgood Co., The, Marion, Ohio.

SHOVEL REPAIRS—Steam and Electric
Taylor-Wharton Iron & Steel Co., High Bridge, N. J.

SLATE WORKING MACHINERY
S. Flory Mfg. Co., Bangor, Pa.

SPROCKETS
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

SPROCKET CHAIN
Webster Mfg. Co., Chicago, Ill.

STEEL PLATE CONSTRUCTION
Hendrick Mfg. Co., Carbondale, Pa.

STORAGE BINS
Brown Hoisting Machinery Co., Cleveland, O.
Neff & Fry, Camden, Ohio

STUCCO FACINGS
Metro-Nite Co., Milwaukee, Wis.
Middlebury Marble Co., Brandon, Vt.
Vermont Milling Products Co., Fair Haven, Vt.

SWITCHES AND FROGS
Central Frog & Switch Co., Cincinnati, Ohio.
Easton Car & Constr. Co., Easton, Pa.

TANKS, STEEL STORAGE
The Blaw-Knox Co., Pittsburgh, Pa.
Traylor Eng. & Mfg. Co., Allentown, Pa.

TESTING SIEVES AND TESTING SIEVE SHAKERS
Tyler Co., The W. S., Cleveland, Ohio.

TRAMWAYS
Interstate Equip. Co., New York, N. Y.

TRANSFORMERS
Burke Electric Co., Erie, Pa.

TRANSMISSION MACHINERY
Plamondon Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago Ill.

WASHERS, SAND AND GRAVEL
Link Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.

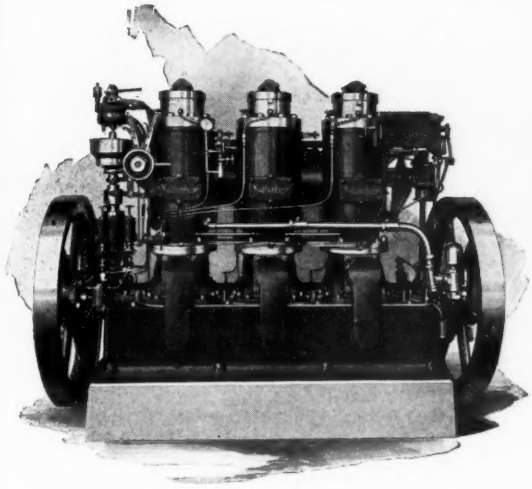
WEIGHING EQUIPMENT
Richardson Scale Co., Passaic, N. J.

WELDING EQUIPMENT
Burke Electric Co., Erie, Pa.
Oxweld Acetylene Co., Newark, N. J.

WHEELS, AXLES AND JOURNAL BOXES
Easton Car & Constr. Co., Easton, Pa.

WIRE ROPE
American Steel & Wire Co., Chicago, Ill.
Leschen, A., & Sons Co., St. Louis, Mo.
Williamsport Wire Rope Co., Williamsport, Pa.

WIRE CLOTH
Cleveland Wire Cloth Co., Cleveland, Ohio.
Tyler Co., The W. S., Cleveland, Ohio.



Kahlenberg

HEAVY DUTY OIL ENGINES

Sizes 25 to 180 H.P.

Distinctive features have put the Kahlenberg in a class by itself. If you are desirous of owning an engine from which unusual results can be obtained, ask for details of the "Kahlenberg." Our booklet, "Construction Facts," is interesting. Have you a copy?

Features of the Kahlenberg Oil Engine

Positive governor control from no load to full load. Variable speed instantly obtainable from just turning over to wide open. Operate on fuel oils, kerosene, distillate or other cheap fuels. Fuel consumption .55 pounds per H.P. per hour. **NO WATER INJECTION.**

KAHLENBERG BROS. CO.

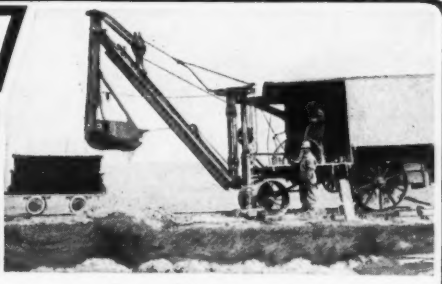
Manufacturers

1720 12th St., Two Rivers, Wis., U. S. A.

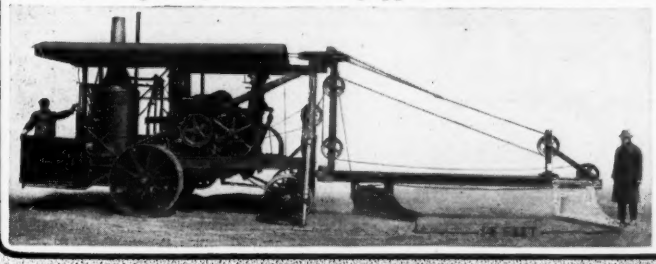
Kahlenberg engines are very simple and easily operated by any man of ordinary intelligence—no valves to regulate, no high pressure air—automatic regulation and lubrication throughout.

TRADE MARK
KEYSTONE
REGISTERED U. S. PATENT OFFICE

STEAM SHOVELS FOR STRIPPING OVER-BURDEN



Where the rock surface is too rough to permit the movement of machines or wagons the KEYSTONE stands on the natural ground level and reaches down into the crevices and depressions with its PULL STROKE DITCHER BUCKET, loading into cars or trucks as shown above. It has a POSITIVELY CONTROLLED DEPTH REACH OF EIGHTEEN FEET and a capacity of about 300 to 400 cubic yards per day. It can be equipped also with clamshell.



For use on level surfaces, loading earth or stone, the SKIMMER BUCKET, shown at left, is mounted without changing boom.

Two Sizes—Model No. 3-10 ton and the Model No. 4-14 ton.

Quickly and easily movable on its own traction power, it is a general utility machine.

The good Keystone Digging Ideas in our Catalogs and advertising sheets will interest quarry engineers and superintendents.

Keystone Driller Company, Beaver Falls, Pa.

Makers of Keystone Well Drills, Keystone Excavators and Downie Pumps

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Buyers' Bulletin

MANUFACTURERS OF MACHINERY AND EQUIPMENT:—These inquiries are live, up-to-date inquiries that have come direct to us from the individual in each case.

READERS OF "ROCK PRODUCTS":—This Department is for your special help and service. If you do not see what you require advertised in "Rock Products," tell us your needs and we will publish them here. There is no charge for this service.

The Lima Stone Co., Lima, Ohio, write us as follows: "A company is being organized for the purpose of operating asphalt rock quarries in Kentucky and will probably be in the market for steam shovels, locomotives, dirt and quarry cars, conveyors, crushers, roll elevators, drilling machinery, electric generators, motors, steam boilers and engines, oil engines, and we will want catalogs with full information as to capacity, prices and how quick delivery can be made, etc. Machinery and equipment will be needed for the removal of dirt and rock overburden, the quarrying, crushing and grinding of asphalt rock, capacity not less than 1000 tons daily."

National Plate Glass Co., R. D. Jones, Supt., Millwood, Pa., want catalogs and prices on locomotive cranes with grab buckets suitable for loading dry sand.

Little Piney Sand and Gravel Co., Newburg, Mo., want a jaw crusher, 8 x 14-in. opening, to crush material to size ¼ in. to 2 in., capacity 4 to 5 tons per hour on 1-in. size material, and gasoline or oil engine with power enough to run this crusher.

Howard Kenyon Dredging Co., P. O. Box 1282, Waco, Texas, advise that they will install a washing and screening gravel plant in Louisiana and want quotations on 10-in. sand pump and fittings; 100-125 H.P. oil engine; 30 H.P. oil engine; small belt-driven hoist; 42-in. x 20-ft. revolving screen with jacket full length; bucket belt conveyor, 50 cy. hourly, 30-in. lift.

L. V. Laurents, Chalmette Hotel, New Orleans, La., wants catalogs and data on sand and gravel pumps, dredging machinery of all kinds, dredge boats, electric motors and generators, hoists and oil engines.

J. F. Griffin, Lock Box 97, Mason City, Iowa, wants prices and information on draglines, large size, 2 and 3-yd. buckets and small size, ½ and ¾-yd. buckets.

M. M. Orndorff, Strasburg, Va., wants catalogs and data on lime kilns.

CORRECTION

In the May 20th Buyer's Guide the address of the American Stone Ballast Co. was given as High Bridge, N. J. This should have been High Bridge, Ky.

Free Service to Readers of Rock Products

If you are in the market for any kind of machinery, equipment or supplies, or if you desire catalogs, information or prices on any product, we are at your service—to obtain for you, without expense, catalogs, prices or specific information on every kind of machinery, equipment and supplies—or to help you find the hard to find source of supply.

RESEARCH SERVICE DEPARTMENT

ROCK PRODUCTS, 542 So. Dearborn St., Chicago, Illinois

Please send me catalogs and prices concerning the following items:

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Address.....

City..... State.....

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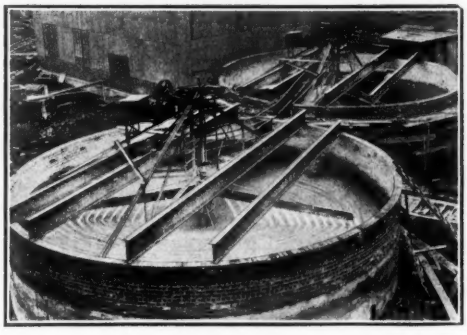

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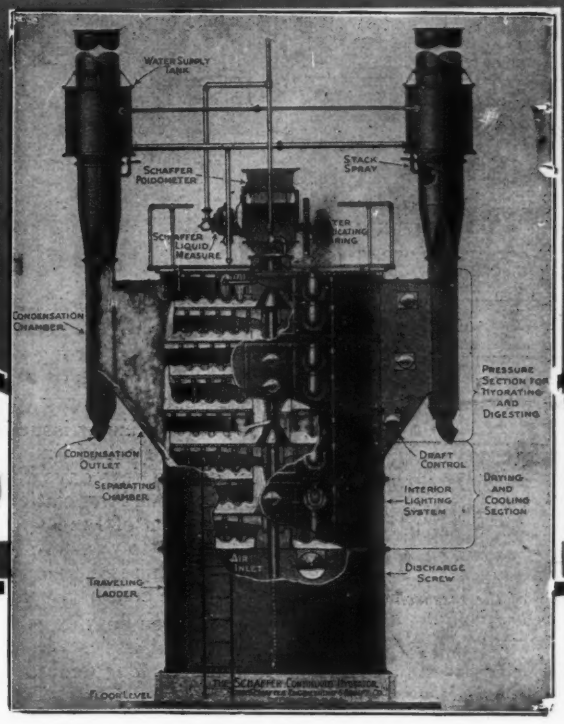
SCHAFFER Continuous Hydrator



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